

MINING WORLD



in this issue

Jet Piercing Costs Cut

Page 29



WORLD'S RECORD

In April of this year, G. L. Tarlton Construction Co., contractors for U. S. R. R. on North Platte Supply Tunnel drove 111 ft. of 9'4" semi-elliptical tunnel in 24 hours. The leading job was done with Eimco Model 21 Loaders.

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturer of Underground Rock Loading Machines
Executive Offices and Factories: 1000 WEST 101 ST. ST. LOUIS, U. S. A.

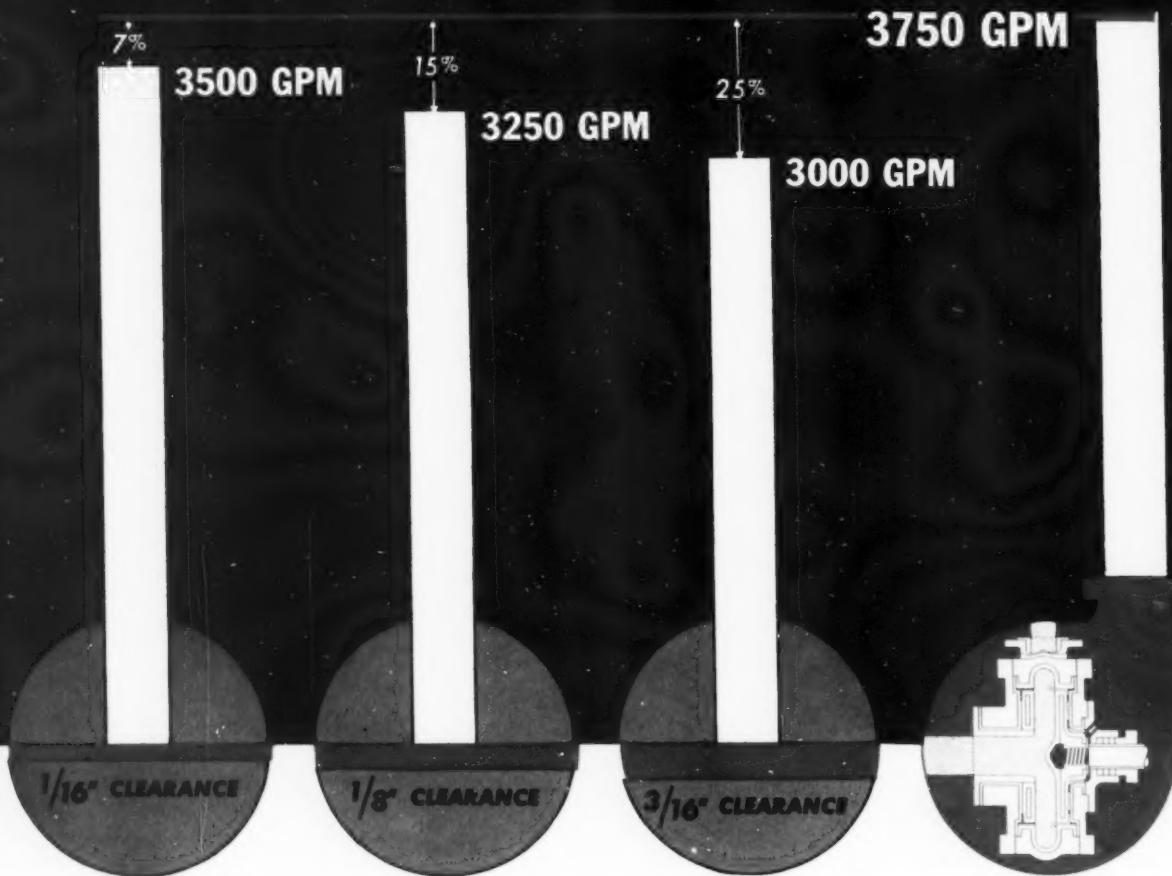
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AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD

JUNE, 1952

Vol. 14 No. 7

25 cents a copy
in Sterling, 3s

How Hydrosealing pays off

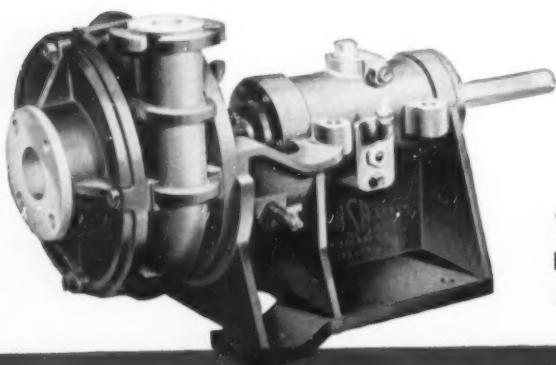


Two twelve-inch dredge pumps were put through the following test. One was of conventional design; the other, a Hydroseal, had clear sealing water between the impeller and side plates to prevent enlargement of the clearance. To simulate normal wear conditions in the conventional pump, clearances between the impeller and side

plates were set at 1/16", 1/8", and 3/16". A head of 160 feet was developed for each test, and all other conditions were uniform for both pumps.

As can be seen above, the Hydroseal demonstrated superior performance right from the start, and since its initial performance is maintained without appreciable loss throughout pump life, this superiority will steadily increase as time goes on.

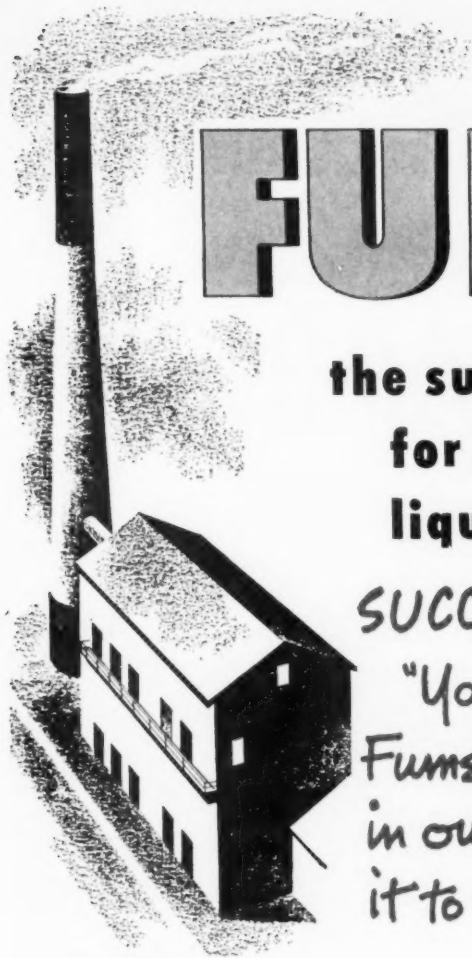
If you're investing in dredge, sand, or slurry pumps, find out what Hydroseals can do for you. Write for Catalog No. 451.



THE ALLEN-SHERMAN-HOFF PUMP CO.
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**HYDROSEAL SAND, SLURRY & DREDGE PUMPS
 MAXIMIX RUBBER PROTECTED**

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TRADE-MARK

the superior **filter** fabric
for fume, dust and
liquid filtration

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What is FUMEALL?

FUMEALL is a combination of virgin wool and synthetic staple fibers. This combination gives the undisputedly superior filtering qualities of virgin wool plus the strength, heat, acid, alkali, and moisture-resistance of synthetic fibers.†

How long does FUMEALL last?

In actual operations, FUMEALL is lasting 4 times as long (and in many instances much longer) as conventional all-wool filter fabrics.

How much does FUMEALL cost?

The initial cost of FUMEALL is little more than any good all-wool filter fabric. Yet when measured in terms of longer life and superior performance FUMEALL costs far less.

How resistant is FUMEALL?

FUMEALL operates successfully in temperature ranges far beyond those permitted by conventional all-wool filter

fabrics (225° to 300°), has greater fire-resistance than most synthetics. In intermittent operations, moisture absorption of FUMEALL is 50% or less than that of conventional all-wool filter fabrics, and shows greater resistance to acids and alkalis present in various filtered fumes and liquids.

What is the porosity of FUMEALL?

You can get exactly the porosity you want with FUMEALL, the right weave for your specific requirements. At present, FUMEALL is available in 4 different weights from most porous 14-oz. to least porous 24-oz. Finer or coarser weaves are available on special order, and FUMEALL can be napped or unnapped to conform to various operating conditions.

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FumeAll is proving highly satisfactory for vacuum filtration in drum, disc and leaf type filters as well as bag type filters. Write or send coupon for samples and details.

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*Patent pending

†DYNEL—a product of Carbide and Carbon Chemical Division of Union Carbide and Carbon Corp.

Industrial Fabrics Division
PORTLAND WOOLEN MILLS, Inc.
P. O. Box 2620, Portland 3, Oregon

Please send me additional details and samples of FumeAll suitable for
 fume collection dust collection liquid filtration

Name _____ Title _____

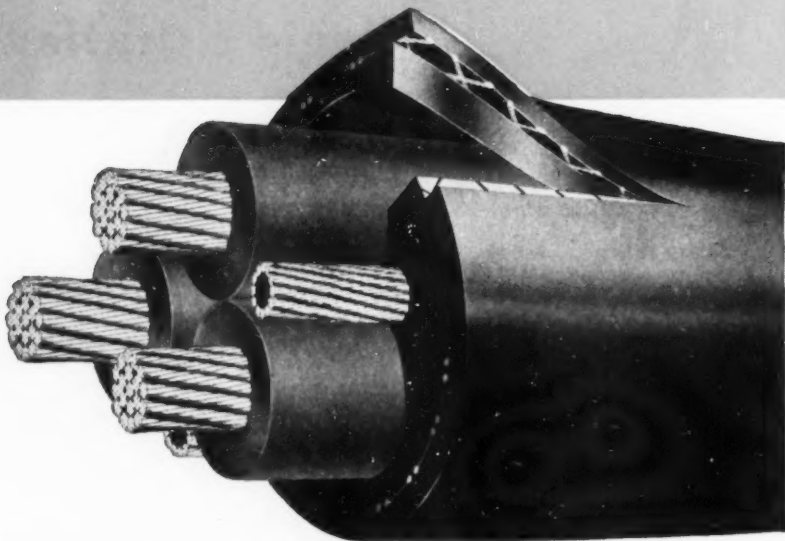
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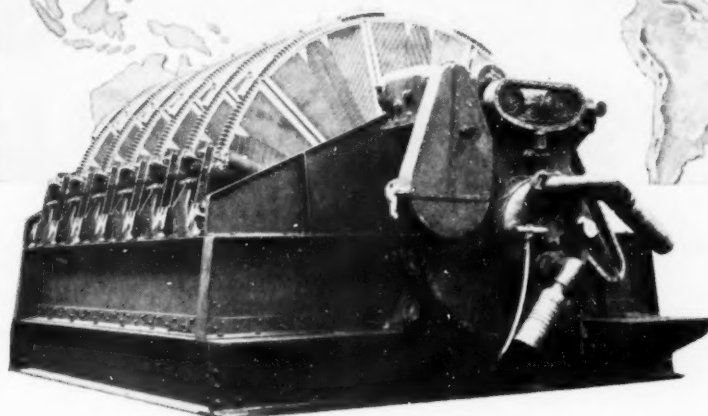
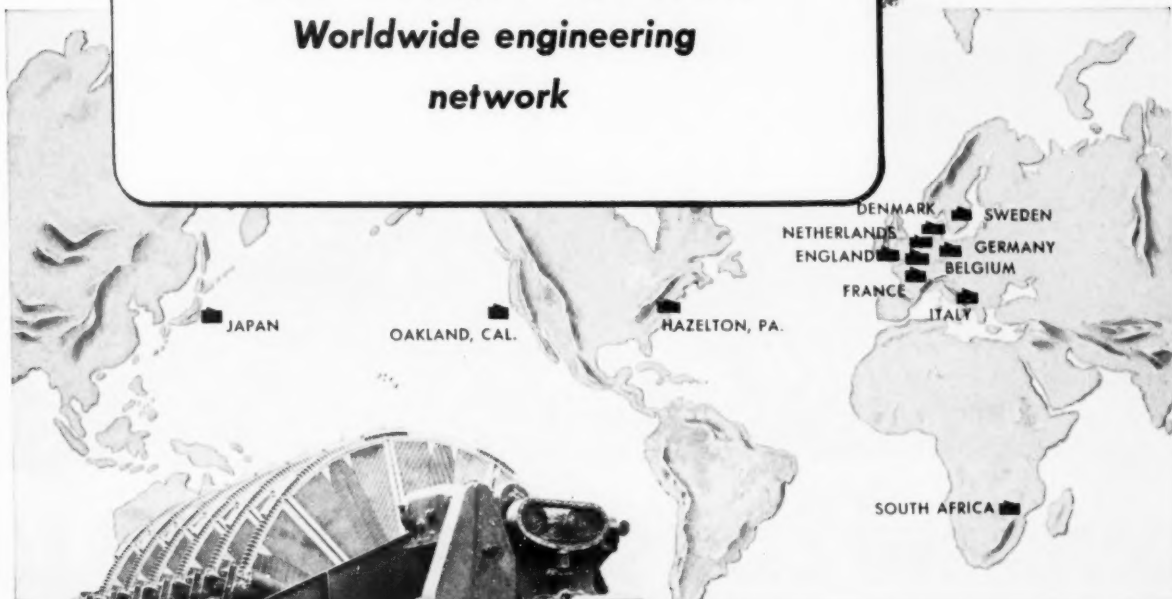
the right cable for the job

ANACONDA[®]

WIRE AND CABLE

MINING WORLD, June, 1952. Volume 14 No. 7. Published monthly, except April when publication is semi-monthly, at Emmett St., Bristol, Conn. Executive, advertising and editorial offices, 121 Second St., San Francisco 5, California. Subscription in United States, North Central and South America, \$3.00 per year; other countries, \$4.00 per year. Entered as second class matter Oct. 10, 1951 at the Post Office at Bristol, Conn., under the act of March 3, 1879. Postmaster: please send notice 3579 to MINING WORLD, 71 Columbia St., Seattle 4, Washington.

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Shop view of an OUF American Continuous Filter built in England by Dorr-Oliver, Ltd. This unit, typical of Oliver disc filter design, provides 560 sq. ft. of filter surface — yet requires only 66 sq. ft. of floor area.

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work of engineering organization . . . established to serve worldwide metallurgy with maximum effectiveness.

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In Australia: Hobart Duff Pty. Ltd., Melbourne.

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HERE'S HOW

Burns Brick Co.

increased clay supply from 30 to

New method cuts manpower needs 55%, reduces costs 66%

Getting enough alluvial clay to fill ever-increasing production goals has always been a problem for Burns Brick Company, Macon, Georgia. Prior to 1942, material was hauled from pit to plant in shovel-loaded dump trucks. From 1942 to 1950, 4 diesel trains of 4 cars each were used. Production reached 30 tons an hour with this method . . . but, by 1950, demand had exceeded even this supply. More clay was needed . . . fast! The job of boosting output fell to the company's vice president, Henry K. Burns, Jr.


Tournapulls solve feeding problems

Burns had his men build a 3-mile pit-to-plant aerial tramway, running from a hopper and feeder at the clay pits to a 50,000-ton storage shed at the plant. 187 one-ton capacity aluminum buckets spaced 160' apart and moving 6 m.p.h. were provided to carry the material over the long cable. About 180 tons of clay could be brought in hourly, if the hopper could be fed fast enough. First feeding tools tried were 2 crawler-scrapers with 19 yds.


combined capacity. Even under the most favorable conditions, these 2 rigs could deliver only 120 tons hourly. Next Burns tried 2 rubber-tired 7-yd. D Tournapulls. They solved the problem! Output was more than enough, and costs were low. After more than a year of operation, major benefits were analyzed as follows:

1. More production. Tournapulls have helped boost output 6 times over that of dragline and rail cars and 50% over crawler-scrapers—from 30 to 120 to 180 tons per hour. Company production records show the 2 "D's" have averaged 1727 tons per 9½-hour shift . . . or 90.9 tons per hour per machine. At times, the "D's" have supplied enough clay in 20 hours to last the brick production line for a week. In spare time, rigs build access roads and levees on Burns Company property.

2. Lower costs. Conversion to the new feeding method has cut costs by two-thirds, according to accurate records kept by the company. Says Mr. Burns: "Our 2 D Roadsters are giving us high production at a very low cost per ton. Negligible tire wear (less than ⅛" on drive tires after 9 months of use) and low fuel consumption (about 3 gallons per hour per machine . . . or 30 tons of clay per gallon)



While tramway is shut down for Saturday inspection, Tournapulls strip overburden, build access roads, or construct levees. On levee work, each rig self-loads 5½ pay yds. in 1½ min., on 2.7-mi. cycles, delivers load every 10½ min.



Loaded "D's" climb 12% to 15% grade on 100' ramp to tramway hopper. With increased clay supply, the Company now turns out 1,250,000 bricks per week. Ten years is the expected life of this pit before tramway will have to be extended.

Operator spots rig over hopper, dumps load in a few seconds. Cycles average 2000' . . . combined output, 180 tons of the 3300-lb. material per hour. With over 2400 hours on the 2 Tournapulls, Owner Burns reports "no downtime to date".

180 tons hourly

— together with Tournapulls' efficient electrical system and their self-loading ability — are reflected in the low cost of each ton of clay we move."

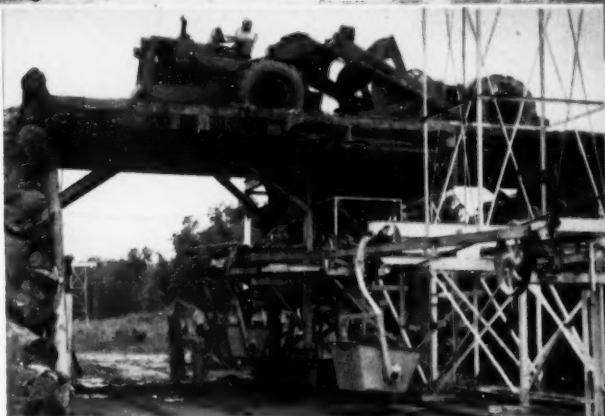
3. Fewer men. Stripping and hauling with the rail system required a crew of 20 . . . the tramway system requires only 9. Besides the 2 D Roadster operators, 3 men are at loading stations, 2 at clay shed, and 2 at intermediate angle stations. In the near future, the 2 angle station positions may also be eliminated.

4. Better mixture control. By making thin cuts of rich clay from one part of pit, and selectively-loading lean clay from another part, Tournapulls automatically blend material in mixture best suited for use at plant. As Burns puts it, "Tournapulls' ability to self-load either slippery wet or hard dry clay enables us to get a more uniform mixture, assuring us a more constant size and a more uniform color in our bricks."

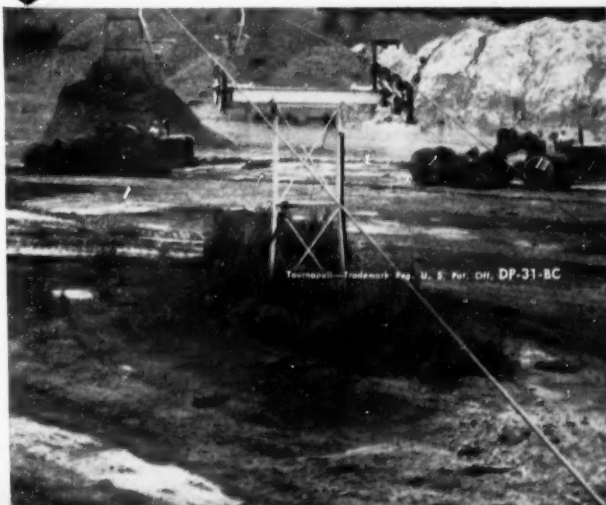
Reduce your costs, speed output

Investigate how much Tournapull can save and earn on your dirtmoving. See for yourself . . . ask your LeTourneau Distributor for production data on work like yours.

R. G. LeTOURNEAU, INC.
Peoria, Illinois



Maintaining 5-to-1 side slope for good drainage, Tournapulls self-load rich and lean alluvial clay in blend best suited for use at factory. Loading in 2nd gear, "D's" make shallow cut over 60' to 300', shaving clay in small pieces for easier handling at plant.



Tournapull—Trademark Reg. U. S. Pat. Off. DP-31-BC



New carriers, "exactly the same as originally furnished," were ordered by the owners when planning an extension to their conveyor system. The 60" wide conveyor, which has moved over 90 million tons of crushed and screened ore, is equipped with S-A Style No. 444 live shaft, heavy duty carriers.



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ALWAYS at Lowest Cost per Ton

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Write for a bulletin on any of the above.

S-A bulk materials handling equipment has cut costs and provided efficient handling in scores of ore mining and processing installations; That's why, over and over again, owners have re-ordered S-A equipment for extensions and enlargements of their ore handling facilities;

During its more than 50 years in the bulk materials handling field, Stephens-Adamson has developed a complete line of equipment and an experienced engineering staff. This combination of men and equipment enables S-A to design and build conveying systems that will move your materials at the lowest cost per ton. Write for details today.

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built to **TAKE IT LONGER**

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For example, when tough going has pulled travel speed down 40 percent, these tractors will have increased their drawbar pull almost 20 percent over rated pull. They will lug down almost 45 percent from rated travel speed before drawbar pull even starts to fall off.

To take full advantage of this important GM 2-cycle diesel engine characteristic, the HD-9 and HD-15 have longer truck frames, lower idlers and sprockets. That means more track on the ground . . . better stability . . . sure-footed traction . . . unequalled *lugability*.

EXTRA LONG LIFE

Here are a few of the many reasons why these newest, finest tractors are *built to take it*.

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- More Power with Bigger Engines — Longer Engine Life
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- Positive Operating Track Release — Works in Oil
- All New, Specially Designed Track Assembly
- Positive-Seal Truck Wheels, Support Rollers and Idlers; Mounted on Tapered Roller Bearings, 1,000-Hour Lubrication!

Your Allis-Chalmers dealer will be glad to explain all of these advantages. See him or phone him now.

**THE NEWEST, FINEST
 LINE ON EARTH!**

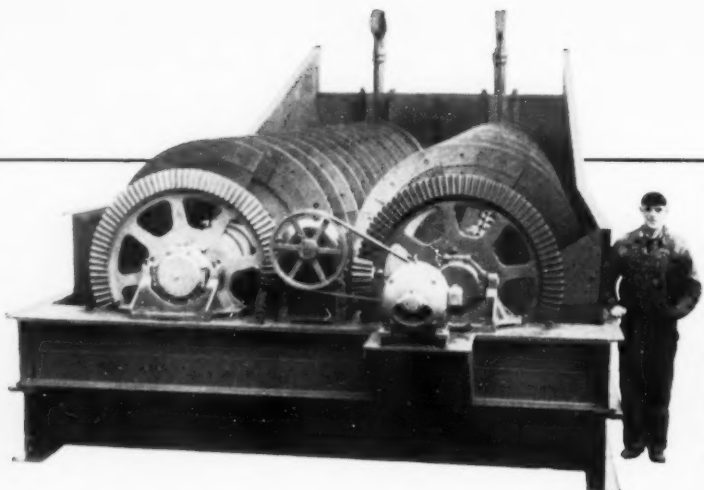
HD-5
 40 drawbar hp.
 11,250 lb.

HD-9
 72 drawbar hp.
 18,800 lb.

HD-15
 109 drawbar hp.
 27,850 lb.

HD-20
 Hydraulic Torque Converter Drive
 175 net engine hp.
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- 3** **Foolproof, efficient bearing units** are of the anti-friction type. Lower unit is grit-proof; upper unit is gudgeon type mounted on hub of bevel gear, designed for extra long life.
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For the War Against Wear in
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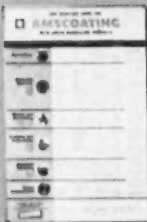
For prompt delivery of these welding products, contact your AMSCO distributor.

➔ **AMSCO AW-79** will meet every requirement for better control of wear where abrasion and impact are important factors—plus all the advantages of automatic welding. Especially suitable for rebuilding and hardfacing tractor rollers, steel wheels, sheeting rolls, dredge pins as well as dozens of other applications. $\frac{1}{2}$ " and $\frac{3}{16}$ " in 22½" ID., 100 lb. coils.

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AMSCO Welding Rods are known for their excellent service in many applications—from rock crushers to materials handling pumps . . . in forging, rolling, stamping, and cutting . . . for gears, sprocket wheels and clutch cams . . . in grinding, mixing, and chipping operations . . . Whatever your problem of wear, there's a "proved-in-service" AMSCO Hardfacing Product that can solve it.

ance; No. 6 is the tougher, and can be machined. All diameters, bare and coated.

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➔ **AMSCO FARMFACE or AMSCO CHROMEFACE** for industrial and farm use. Deposit has excellent resistance to low stress sliding abrasion. All diameters, bare and coated.

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➔ **TUNGSTEN CARBIDE.**

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Non-Metallic
Minerals



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Cyanamid

COMPANY

MINERAL DRESSING DIVISION
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GRAB SAMPLES From the Mail

Help Wanted!—Diamond Miner Asks Advice

Dear Sir:

I am investigating the possibilities of a machine capable of excavating diamondiferous gravel under the following conditions:

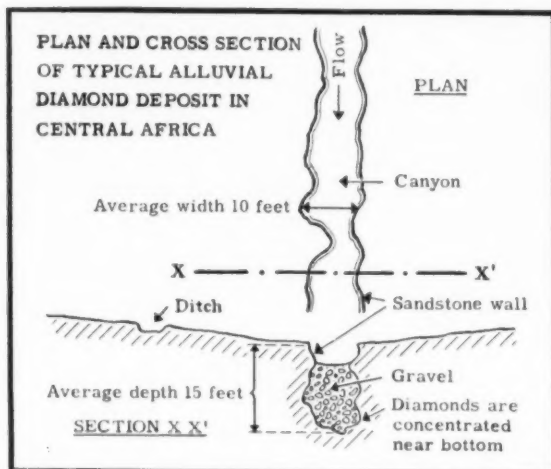
The gravel is composed mainly of sand with a few pebbles under four inches in diameter. The gravel lies in river canyons with irregular walls as shown in the sketch (below). Canyon dimensions are irregular too but will average 10 feet in width and 15 feet in depth. The river runs on the surface of the gravel.

Until now the deposit has been worked by hand, with a dam upstream and the river water diverted in ditches. After this has been accomplished the canyon is divided into 100-foot long sections, the water pumped out of a section and the gravel excavated with hand shovels.

The shortage of native workers (the deposit is located in central Africa in semi-desert country) reduces production and I am now considering the possibility of working with suction pumps.

I would like to know if you know anyone operating under similar conditions. If so, what type of equipment they use for excavating the gravel and where I can buy similar equipment.

Rene Berger
Ingenieur Civil des Mines
Paris, France.



Similar mining problems must have been solved in several different ways by *Mining World* readers. Send in your recommendations for methods and equipment needed. They will be forwarded to Mr. Berger and pertinent recommendations reprinted in this column in an early issue. The editors have two methods in mind to date.—Ed.

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Manager of Kozlu Mines
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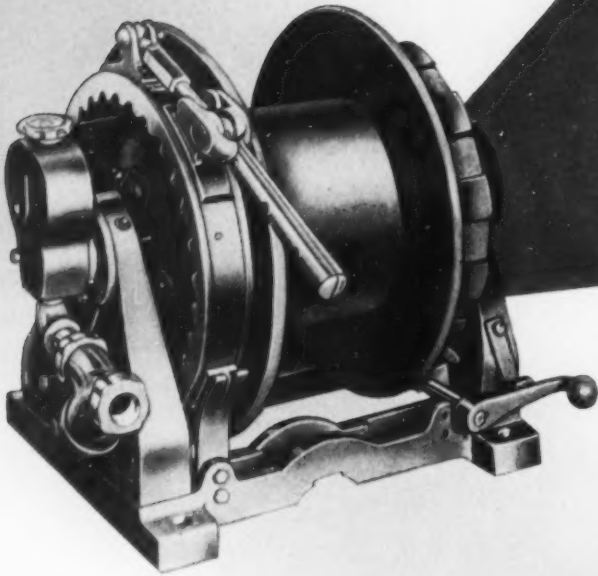
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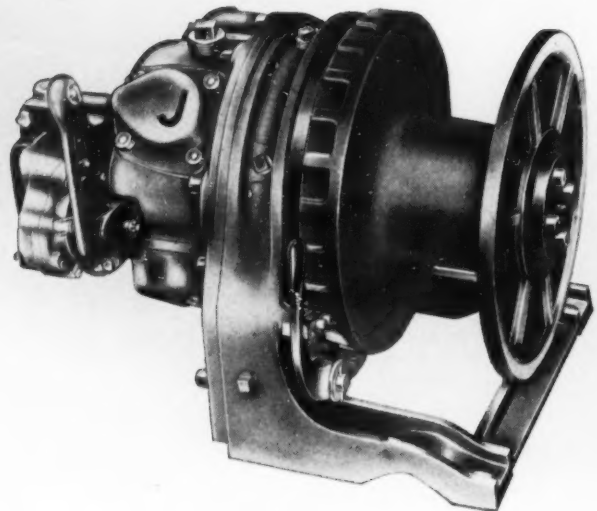
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TOP: Model F-113 "Turbinair". Compact, simple design with motor *inside* the drum. Direct power transmission from motor to drum assures maximum efficiency. Simple, accessible controls make operation easy.

RIGHT: Model DW-111 "Pistonair". Features reversible power with light weight. Four-cylinder, $3\frac{1}{2}$ h.p., reversible motor will handle up to 1200 lbs.

FAR RIGHT: Model L-111 "Pistonair". For heavy hoisting jobs. $7\frac{1}{2}$ h.p., reversible, five-cylinder motor for loads up to 2000 lbs.

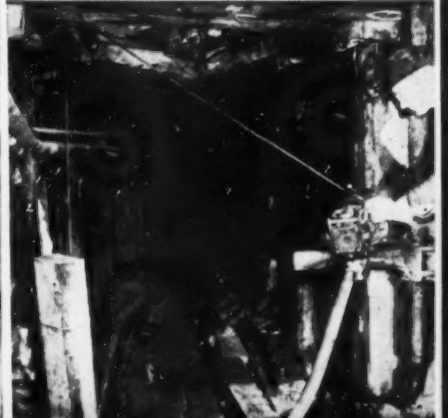


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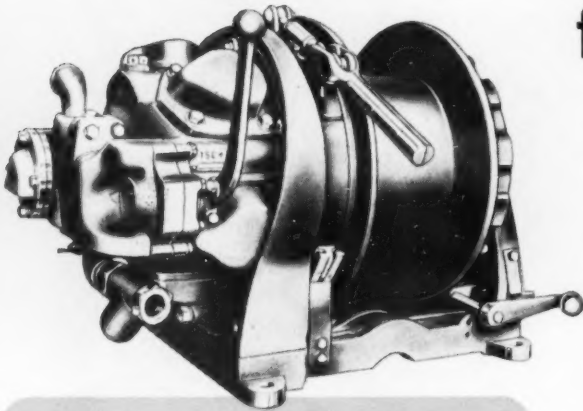
Joy E-112 "Turbinair" lifting timbers in a raise in a western mine. The extra rope capacity of the E-112 (450' of $\frac{3}{8}$ " rope) makes it applicable to any of the utility hoisting needs in this mine.

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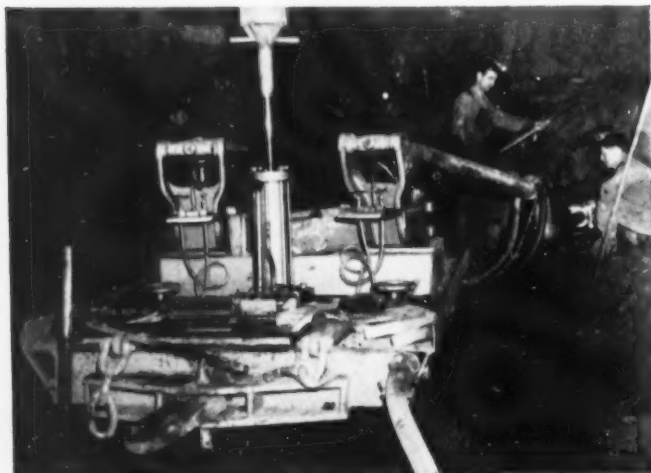
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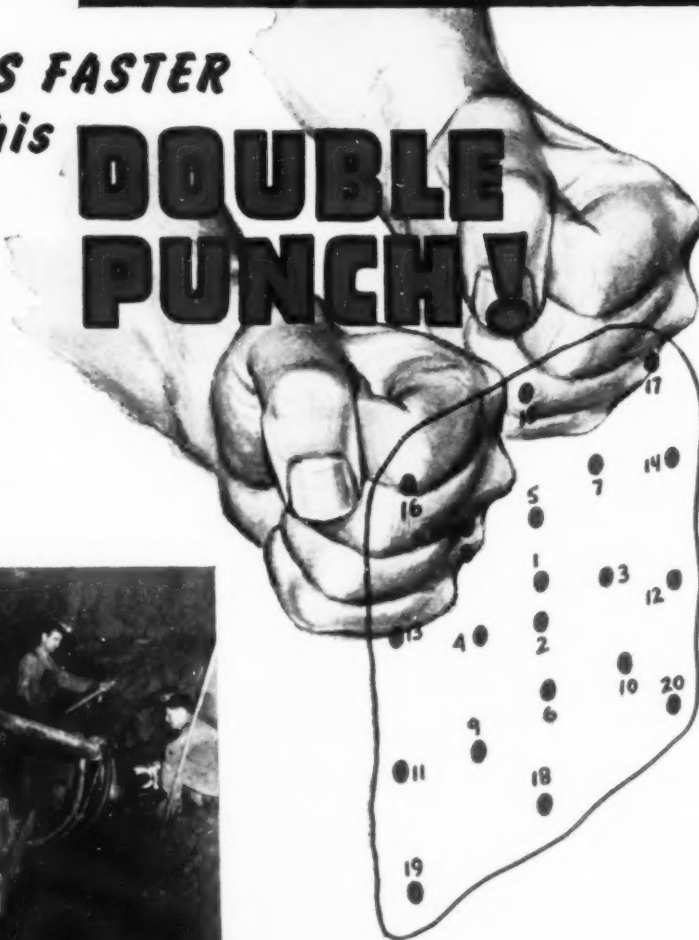
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MINING WORLD

and the export edition
WORLD MINING

A Miller Freeman Publication

Published monthly except in April when publication is semi-monthly

JUNE, 1952

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DRIFTS AND CROSSCUTS

What is the True Tungsten Picture?

Some surprising and contradictory reports have recently been circulated regarding tungsten. It has long been known to many that certain individuals and groups in Washington have gone out of their way to discourage maximum production of tungsten ores within the United States.

Only through the office of Congressman Clair Engle of California have certain discouraging statements for domestic tungsten miners made by George Holderer, chief, Ferro-Alloys Branch, Defense Materials Procurement Agency, been released to the public. He is reported as saying "that the extreme urgency for tungsten no longer exists".

One of the nation's largest tungsten producers does not agree with Holderer. His company is besieged with would-be-purchasers of tungsten concentrates. Many requests come from users who normally prefer a different type of concentrate than the type the mining company produces in greatest tonnage. The would-be-purchasers reported that when they couldn't get what they normally used, they looked for any tungsten because they needed it.

A check with one of the nation's most important users of ground tungsten rod who has high priority contracts with the United States' Navy, Air Force, Army, Bureau of Standards, and Federal Communications Commission brought the terse reply "we still have to fill out as many government forms as ever and don't get tungsten when we need it".

Tungsten concentrates are under allocation according to provisions of DMA orders MO-4, and MO-6. Tungsten-containing products are under DPA allocation pursuant to orders M-30, M-80, and M-81.

The domestic mining company is ordered to allocate its production and the DMPA allocation official in Washington has reported great difficulty in finding enough tungsten to fill allocations.

The National Production Authority agrees with the miners and users of tungsten in its latest list No. 6 "List of Basic Materials and Alternates" as it reports "The supply of nickel, cobalt, and other ferro-alloy metals continues most critical".

The rush of certain world-do-gooders to encourage tungsten production outside the United States, notably in Bolivia, is well known. Millions of U.S. dollars have been committed to increase tungsten output there.

One cannot help wonder how much tungsten will be available from Bolivia, now, or in the near future. The new president, Paz Estenssoro, (by revolution) has publicly called for nationalization of the tin mines. Foreign Minister Walter Guevara has joined him in this desire. They both have expressed the view that a well-balanced commission should study nationalization. Juan Lechlin, the Minister of Mines and Petroleum, has called for nationalization swiftly to prevent sabotage by the big companies.

If nationalization of tin is accomplished, tungsten can well be next. Output of tungsten is doubly jeopardized because orders for new machinery for tungsten mines and mills were cancelled following the revolution.

Development of domestic tungsten deposits is the only safe method to assure an adequate supply of tungsten now and in the future.

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MINING WORLD



CAPITOL CONCENTRATES

BASE METAL USER'S BUYING SLOW-DOWN MAY BE TEMPORARY

The supply of zinc over demand (as measured by the NPA control order) is expected to show a surplus of 130,000 tons. Lead is the first metal to drop below the OPS ceiling price, and was quoted in mid May at 17 cents a pound at New York. Yet, as we have pointed out, these conditions may be only temporary.

The lack of dollar exchange abroad is encouraging the sale of lead, zinc and other raw commodities to us for dollars. In so doing, the European nations must be robbing their own defense efforts of needed raw materials, indicating a slow-down in their arms programs which may be considered alarming. Our own defense program is said to lag by \$5,000,000,000 causing further present slackening in demand. The tendency of industry to buy heavily during shortage periods, and to dump high-priced inventories when more adequate supplies appear, further accentuates these swings.

Stalin's clever peace offensive seems to have taken a good deal of starch out of the defense agencies which have shown almost no sense of urgency for a long time, no doubt the very objective of Stalin's tactics. It is hard to keep a democracy wound up. Yet, one loud roar from the direction of the Kremlin and it is likely that we would be short of everything again!

• Let's Use The Right Word

We have objected frequently to the use of the word "grubstake" which former U. S. Bureau of Mines director James Boyd unfortunately applied to the Defense Minerals Administration's program—a word which the brass hats still are bandying about. Any resemblance between the DMEA program and grubstaking is purely coincidental.

Now the press items are taking a new tack and calling this an exploration subsidy plan, one quotation being: "Discoveries of strategic mica in North Carolina and manganese in Arkansas, which were announced recently, were made under the subsidy exploration plan." Any resemblance between the DMEA program and a subsidy plan also is purely coincidental.

Let's get our terminology straight for public consumption anyway!

• Access Roads are Authorized

While the access-road program of DMPA is not as helpful to small mines as was the program of World War II, still something is being done. Some 45 roads have been approved, for a total expenditure of \$5,956,588, or an average \$130,000 per project. Or to phrase it differently, a total of 1,254 miles will be built at a cost of around \$4,750 per mile. Seven uranium projects are included. Should be pretty nice mine roads!

• Slow-Down Is Evident

There is little doubt but that the defense minerals program, which never seemed too urgent to a great many bureaucrats, has slackened perceptibly. To a great extent this is also true of other defense programs. A good part of this may be due to the Korean truce talks and the trend of Stalin's phony war which lately took on a conciliatory complexion. The only effort which does not

seem to slacken is that of the order writers and press-release divisions. These divisions continue to clog the mails with their products, but they are running out of things to talk about.

• Domestic Mines Deserve Equal Consideration

If the U. S. government decides to pay Chile 33.5 cents for copper there is no excuse for not paying at least the same amount to open new domestic copper mines, or to expand production from presently operating mines. If the price line of 24.5 cents is to be held, the additional money should be paid as a subsidy on the incentive-plan system. Even the most rabid opponent of producer subsidies must admit that it would be more profitable for this country to spend a six-cent subsidy here than to pay a six-cent tax (which is what it amounts to) to Chile.

• OPS Controls on Ores and Concentrates

OPS is said to be considering the decontrol of copper, lead and zinc ores and concentrates. As the inflationary effect of metals is controlled by ceiling prices at the smelter level, it is clearly absurd to control ore and concentrate prices. As a technical matter, probably most mines are in violation of OPS price ceilings on ores and concentrates and are thus subject to triple damages. It is understood that OPS snoopers, busy disrupting production in the Tri-State area, soon may look for new fields to conquer.

• Ceiling on Floor Price Set by DMPA

Of the three major nonferrous metals, copper seems to be the only one which DMPA believes is really in short supply at present, and developments in Chile complicate the picture further. Demands for higher prices, the strike, and cancellation of the Chile-U.S. copper pact can be expected to cut down supplies of Chilean copper materially.

In face of all this, DMPA has clapped a 25.5-cent ceiling on its floor price contracts, making it impossible for higher cost producers to get into operation. But Chile has been getting 27.5 cents and may get a much higher price before negotiations are all over. Where is the logic?

• Think This Over

If you are an Arizona wage or salary earner, it's going to cost you about \$115.00 a year to support federal bureau jobholders.

The breadwinners of Arizona are going to have to give up a total of about \$34,439,035 out of their standard of living to support the federal jobholders each year under present conditions.

So stated V. F. Mueller, president of Deer-O Paints and Chemicals, in Phoenix.

"Bureaucracies grow faster than the birth rate," Mueller commented. "Latest government figures show that, while the population of the United States has increased less than 17 percent in the past 10 years, the number of U. S. government civilian employes has increased in that same time nearly 75 percent. Counting state, county and local governments, one out of every nine wage and salary earners is on the public payroll."

"Every breadwinner should ask himself whether so many public jobholders are really necessary for good government—because he is paying for them," Mueller added.

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Bucyrus-Erie hydraulic dredges are built to provide an extra margin of strength and dependability above the user's minimum requirements. Bigger, stronger cables, larger diameter drums, deeper and stronger hulls, extra tough alloy steels — these are but a few of the places where Bucyrus-Erie gives added measure for better dredge performance.

Control

From drawing board to delivery, Bucyrus-Erie dredges are built under *one-company* responsibility and control. Casting, metal-hardening, machining, assembling and testing are done in Bucyrus-Erie's own shops — by skilled workmen with years of dredge experience. When you get a Bucyrus-Erie dredge — hydraulic, dipper or placer — you can rest assured it's the dredge for your job.

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Penn Chemical Company's copper-zinc properties lie in a valley tributary to the Mokelumne River (beyond the second range of hills) in California's historic Calaveras County.

ZINC MINING ON "MOTHER LODE"

Penn Chemical Company, Campo Seco, California, solves metallurgical problems, mechanizes mines, and increases zinc and copper production

The Penn Chemical Company's Penn mine near Campo Seco in California's gold- and jumping-frog-famous Calaveras County, has had both the history and the problems that typify most of the West's small base-metal operations. Most of these mines, largely without the cushioning advantages of financial backlogs or blocked-out ore reserves, are the ready victims of capricious metal markets and show production only during periods of favorable prices. Many operate against additional handicaps in the form of complex vein structures, difficult milling problems, distant markets, and unreliable or totally absent skilled labor supplies.

Nevertheless, when a production expansion of zinc, lead, copper, and the strategic metals is needed, these small properties account for an important part of increased mine output. Since the country's larger mines must often operate at near capacity

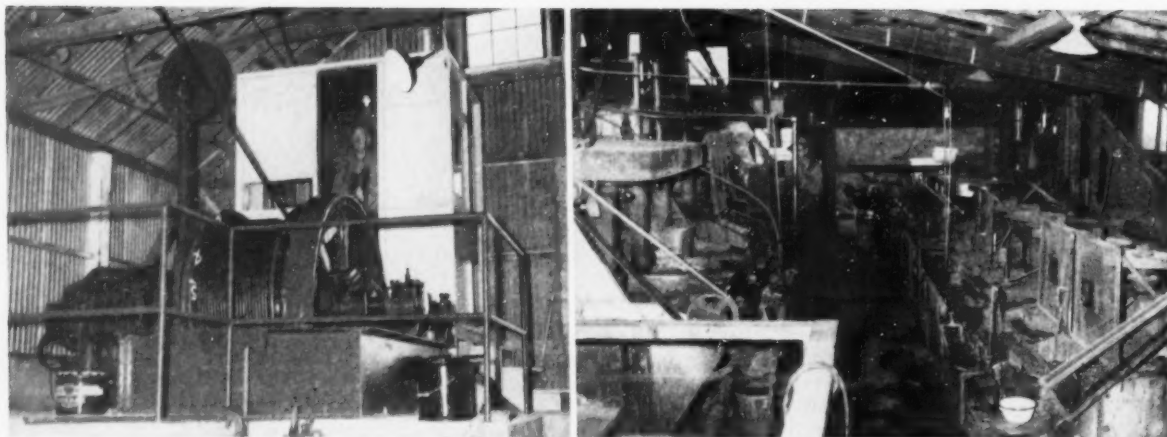
during low price periods to maintain low overall costs, they consequently are often unable to expand quickly in answer to emergency demands. That the country's small mines must be called on for emergency expansion has now been officially recognized in the form of government

exploration and development loans and production contracts, greatly reducing the obstacles caused by lack of finances, ore reserves, and ready markets.

Government aid, however, is not the only stimulus and many important small base metal producers, such

LEFT: C. F. Fisk, president of the Penn Chemical Company. **CENTER:** George Scibird, assayer at the Penn, handles the analyses that are required for the close control of both mining and milling. **RIGHT:** Harold Hansen, general superintendent of the Penn operations.





LEFT: Hoisting engineer Alex Casey is driving the reconditioned Taylor hoist brought down from Grass Valley. RIGHT: The upper row of Denver Sub-A cells, operated by Frank Cullers, separates a copper-lead concentrate that carries the gold and silver missed by the Knutson amalgam bowl. The lower row of 12 special Denver units produces zinc concentrate.

as the Penn mine, owe their existence to faith and private capital.

Long-Time Production

The copper-zinc-lead-gold-silver deposits that are now worked as the Penn mine were discovered in 1861 and developed as separately owned operations. By 1867, the area showed great activity and over 3,000 tons of ore, none assaying less than 15 percent copper, were shipped to San Francisco. Toward the end of this period, a Welsh-type furnace was erected to smelt ores of somewhat lower grade.

Only minor production is recorded for the area until shortly before the turn of the century when the Penn Mining Company consolidated the properties. At this time a smelter producing blister copper was built somewhat west of the main workings and was operated continuously until 1919, when the price squeeze again prevented profitable operations. Gold, silver, and copper were the only metals recovered from the early operations since no economical method of working the high-zinc ore was known.

Sporadic attempts at working the zinc deposits were made after 1919 but production was not resumed until World War II. The Eagle Shawmut Company then leased the mine and trucked ore 70 miles to its flotation mill near Chinese Camp, Tuolumne County, where they produced two concentrates—copper-lead and zinc—to be shipped to the International Smelting and Refining Company's Tooele, Utah plant.

Penn Chemical Formed

Eagle Shawmut's lease was dropped in 1947 when federal metal premiums ceased. In 1948, the newly formed Penn Chemical Company took a lease and option on the

property and began the present period of activity with Harold Hansen as general superintendent. C. F. Fisk is president of the operating company and E. L. Harp, vice president.

Geologic Studies and Results

The Penn deposit is within a mile of the western foothills of the Sierra Nevada, where Paleozoic and Jurassic metamorphic rocks are overlain by early Tertiary sediments and invaded by various intrusives.

The area was examined by members of the United States Geological Survey during World War II and their report is carried in "Copper in California," Bulletin 144, California Division of Mines, 1948. From this and earlier interpretations, the Penn copper and zinc sulfides are thought to be confined to sericitized, silicified, and pyritized vein-like zones and lenses in felsic metavolcanic and intrusive rocks.

Bedding and primary layering steeply dip to the northeast and strike northwest; with schistosity, cleavage and alteration zones following, in general, this regional trend.

Of the three groups of faults identified, a series of low-angle reverse faults are of major importance. Though all of these faults are considered pre-mineral, much of the movement occurred after deposition, causing displacements that have led to important differences of opinions on the position and correlations of many large known and inferred ore bodies.

The three major ore-bearing alteration zones—the West, the East, and the Hinckley—opened by the No. 2 and No. 3 shafts have been

cut by the Campo Seco reverse fault. Former examinations led to the belief that the dip slip of this fault was in the order of 1,000 feet and the correlation of known shoots above and below the fault based on this supposition led to the inference that only two major alteration zones existed. More recent studies, including the recent work by consulting geologist Francis Frederick, have indicated that this displacement is more likely to be only 30 to 90 feet, completely changing the correlation of deposits above and below this fault. This lesser displacement would further imply that valuable unopened pre-fault bodies that are a continuation of the known alteration zones lie within reach of present workings—two below the fault and one above.

The deposits were mined originally through five separate steeply inclined shafts, two of which—the No. 2 and No. 3—accounted for most of the recorded production. These two, the only openings now used, were never connected by a haulageway though two ventilation raises were driven from the No. 2 shaft workings to the No. 3 shaft workings. The latter was developed to the 3,400 level, and the No. 2 to the 1,200 level. Through lack of maintenance, however, the lower workings are no longer accessible and present activity is confined to the area above the 900 level in the No. 3 and the 800 level in the No. 2, the present levels of water in the two shafts.

High-Zinc Left in Old Stopes

Much of the ore being taken from the Penn is from old stopes where the once unprofitable high-zinc ore was left by former operators. Since appreciable tonnages of this ore

have been blocked out, present development can be financed by profits and new areas opened without unduly straining the economic position of the operations.

The year of inactivity immediately preceding the Penn Chemical Company lease and option allowed both shafts to fill with water. The upper levels were cleared by the Penn Chemical Company with a stainless-steel, Byron-Jackson, double-stage pump at the No. 3 shaft and a stainless-steel, Ingersoll-Rand, single-stage pump at the No. 2. The water was carried from the mine through rubber hose to Johns-Manville transite pipe leading to wood precipitation tanks near the No. 2 shaft. The mine water has been found to average about 1 $\frac{3}{4}$ pounds of copper per ton. The metal is recovered as a 70 percent copper precipitate replacing iron shavings placed in the long, shallow precipitation cells. Dewatering has continued in an attempt to clear the mine to lower levels. When the original stopes were reopened, a zinc-ore remnant between the 300 and 500 levels in the No. 3 shaft workings was checked by assaying the cuttings from short (five-to six-foot) drill holes drilled from the accessible faces. Estimates from this examination indicate 45,000 tons of ore containing roughly 7.0 percent zinc, and 1.5 percent copper, \$5.00 in gold and silver and appreciable amounts of lead per ton. Smaller blocks were subsequently outlined above the 300 level in the No. 2 shaft and above the 500 level in the No. 3.

Mechanization Speeds Production

About 75 percent of the present



The old Penn mill has been reconditioned to produce gold amalgam and concentrates of copper-lead and zinc. It is shown here during extension of the near side to allow for future expansion to 200-ton capacity. The Penn No. 2 headframe can be seen above the center of the mill buildings.

mill feed comes from active stopes in the No. 3 ore block, the remainder from stopes in other sections of the No. 3 and No. 2. Mine foreman O. G. (Pat) Cruickshank accredits the recently introduced Ingersoll-Rand carset bits, jack-rods, and JA-45 jackhammers mounted on pneumatic jacklegs with the favorable production per-man-shift that has been achieved with relatively unskilled labor available at the Penn.

The No. 2 shaft is equipped with a reconditioned Taylor Foundry and Engine Company single-drum hoist driven by a General Electric 100-hp., three-phase, 440-volt motor. This hoist winds a $\frac{7}{8}$ -inch rope carrying a two-ton skip at a speed of 650 feet per minute. The hoist

room also houses a 1,200-cubic foot-per-minute Chicago Pneumatic compressor powered by a 200-hp., Westinghouse motor.

Ore and men are hoisted from No. 3 shaft with one drum of a double-drum hoist carrying a three-quarter-inch rope and driven by a 100-hp. Westinghouse motor. Air is furnished by a 640-cubic-foot-per-minute Laidlaw Worthington compressor powered by a 100-hp. General Electric motor.

Remodel, Enlarge Mill

The ore blocked out in the two shafts after dewatering warranted mill construction and the old mill near the No. 3 shaft was redesigned and rehabilitated to produce an amalgam from the ore's free-milling

LEFT: The Penn No. 3 shaft hoists 75 percent of the ore produced at the mine and has the largest single block of proved ore. Ore is loaded at the base of the shaft bin into a truck for transfer to the mill. **RIGHT:** The No. 2 shaft headframe and hoist house adjoin the office shown at the right. This picture was taken from the ore-truck ramp at the head of the flotation mill.



gold and two flotation concentrates—one, copper-lead; the other, zinc.

The mill was rebuilt to handle 70 tons of ore per day but later successful ore development in the mine has indicated that a larger mill, with resulting lowered costs per unit, was necessary to handle future production. The hoisted ore is trucked from the shaft bins to the coarse ore bin above the mill. From here it is fed through a 12 by 20 inch Pacific jaw crusher to a 3 by 5 foot vibrating screen. The coarse fraction from this screen is crushed in a 2-foot Symons cone and added to the passing fraction in a fine ore bin above the grinding and flotation sections.

The crushed ore from the second bin is ground in a 16-inch by 5-foot Hardinge conical ball mill and passed to a 12 by 24 inch Pan-American jig to separate the free milling gold. The auriferous jig product is recleaned in a Knutson bowl for subsequent refinery recovery of the gold. Overflow from the Knutson bowl is combined with jig overflow and pumped to a Dorr rake classifier operating in closed circuit with the ball mill. Classifier overflow goes to the conditioner tank at the head of the copper flotation circuit.

Metallurgy Solved

When ore from the old stopes was first processed in the mill, the oxidized copper sulfides activated the zinc minerals in the copper circuit and prevented both clean separation and high copper recovery.

By the careful addition of cyanide, zinc sulphate and lime to the ball mill and zinc sulphate, Cyanamid's 404 oxidized copper collector and MIC frother to the 5 by 6 foot

copper conditioner, the zinc and iron in the feed were successfully depressed and a high copper recovery achieved.

The primary flotation circuit has five 28 by 28 inch Denver Sub-A cells and produced a concentrate containing 23.0 percent copper and 7.0 percent lead along with the gold and silver that bypasses the Knutson bowl. Cyanide is added to the cleaner cell in this circuit to further insure the inhibition of iron minerals. A second 5 by 6 foot tank received the tailing from the copper section conditioner where copper sulphate, cresylic acid frother, and lime are added, bringing the pH up to 10.5. The 12 32 by 32 inch special Denver Sub-A units in the zinc flotation circuit produce a concentrate averaging 55.0 percent zinc.

Copper concentrate from the primary flotation circuit is temporarily stored in a 20 by 10 foot thickener to await filtering; storage for the zinc product is afforded by a 14 by 10 foot thickener. The concentrates are dewatered alternately by a 6-foot, 4-leaf Oliver filter feeding to single concentrate bin.

The concentrates are hauled through Campo Seco to a road-to-rail transfer at Valley Springs, a distance of about 6 miles. The zinc concentrate is smelted at Amarillo, Texas, and the copper at Tacoma, Washington.

Tailing from the mill flows to a series of large dammed ponds between the millsite and the southeast bank of the Mokelumne River. Mill expansion under the direction of Art Dirrim, mill superintendent, and Harold Cruikshank, mill foreman, required an enlargement of the original buildings and the addition of a ball mill, a classifier, and

cells in both the copper and zinc circuits; the original crusher and dewatering section were found to have the required capacity.

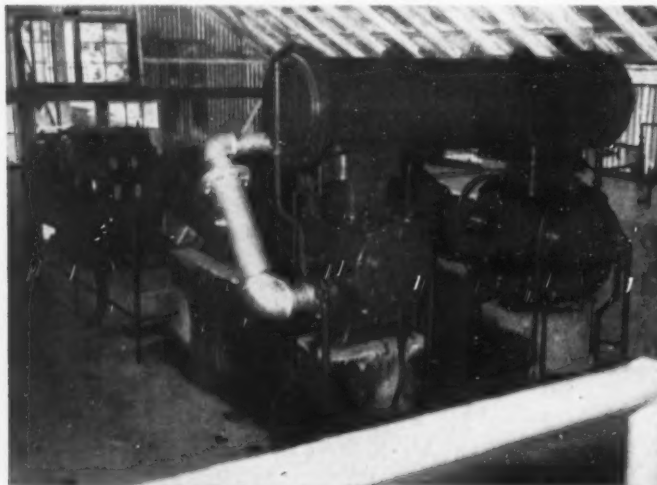
Auxiliary Facilities

Water for the mine and mill is pumped from a station below the Pardee Dam on the Mokelumne River near the No. 2 shaft. The main supply pumping unit is a 3-inch centrifugal Fairbanks-Morse operating against a 190-foot head and mounted on a miniature marine railway so that low water will not cause the 7-foot suction to be exceeded and to prevent flash floods from endangering the unit. The pump discharge is connected to a 6-inch Spiraweld supply line by a flexible hose to allow movement along the marine railway. An ancient, though serviceable, steam-operated piston pump is maintained near the newer unit for standby. Tanks, remnants of a former chemical plant, serve for water storage on a hill above the No. 2 shaft.

The Penn mine offices, on a hillside between the No. 2 shaft and the mill, house one of the operation's most important units—the assay laboratory. Realizing that potentially profitable mines have failed for the want of accurate knowledge of mine and mill products, the Penn management has carefully guarded against losses from such a cause. Under the direction of assayer George Scibird, close and constant checks are made on mine and mill production through a regular program of sampling drill cuttings, mill heads, concentrate, and tailing.

Auxiliary buildings at the Penn include a 60-man dry, machine shops, foremen's houses, and a 35-man bunkhouse.

LEFT: Compressed air for the No. 2 shaft workings is supplied by this Chicago Pneumatic compressor housed in the hoist building. **RIGHT:** Miners Ramirez and Hernandez are cleaning down one of the producing stopes at the Penn in preparation for the shift's round.





INTERNATIONAL PANORAMA



AURORA, MINNESOTA—The largest single certificate of necessity—\$298,070,000 at 75 percent accelerated amortization—ever granted by the DPA has been given to the Erie Mining Company (Pickands Mather & Company, and associates) for new taconite production facilities.

COLUMBUS, MONTANA—The Moutat chrome mine is to be put back in production by the American Chrome Company. The Goldfield Consolidated Mines Company of Reno will supply \$1,000,000 in operating capital and the DMPA will loan \$2,825,000.

NICARO, CUBA—The National Lead Company has acquired a majority interest in the Nickel Processing Company which operates the United States' government-owned nickel plant here. Annual nickel output has been raised to 20,000,000 pounds.

ROBERVAL, QUEBEC—The sulphur Converting Corporation plans to build a \$5,000,000 sulphur recovery plant here. Pyrite will be the source of sulphur.

BRUSSELS—The Compagnie Geologique et Miniere des Ingenieurs et Industriels Belges Sac. Anon (GEOMINES) has increased capitalization from 200,000,000 to 700,000,000 francs to permit deeper mining of its tin-tantalum-columbite deposits at Manono, Belgian Congo.

JOHANNESBURG—First production of byproduct uranium has been made at one of the Rand gold mines. Six byproduct plants are under construction and plans call for building an additional six.

JOS, NIGERIA—The Mines Development Syndicate (West Africa) Limited has started an underground exploration and development program at its Abakaliki lead-zinc properties in south-eastern Nigeria. Surface trenching and diamond drilling have been moderately encouraging to date.

STOCKHOLM—The Boliden Mining Company is building a new sintering plant at its Ronnskar lead smelter. Plant completion in 1954 should increase annual output by 50 percent.

BOMBAY—India Aluminum Company Limited is planning to double the capacity of its Travancore plant with first increased production available in 1954.

WASHINGTON—The DMPA has announced that stocks of mercury in the National stockpile and in consumers warehouses are believed large enough to take care of foreseeable military and domestic requirements.

MEXICO CITY—Japanese firms are interested in buying iron ore from the El Mamey and Nuchitlan deposits near the Pacific port of Manzanillo.

NEW ORLEANS—Production of sulphur by the Freeport Sulphur Company during the first quarter of 1952 was at an all-time high rate—413,000 long tons.

CAIRO—Egypt's first steel mill with an annual capacity of 115,000 tons will be erected at a cost of \$51,600,000 by a group of German engineers.

WASHINGTON—Iron ore producing companies have received \$254,000,000 worth of rapid-amortization tax certificates from the Defense Production Administration. Aluminum producing companies have received \$460,000,000.

CANBERRA—Production of uranium on an important scale will begin in 1954 from the Radium Hill district, South Australia. Agreements for production have been concluded between the Australian government, the South Australian state government, and the Combined Development Agency of the United States Atomic Energy Commission.

CUSTER, SOUTH DAKOTA—Beryl reserves in the Black Hills have been estimated at 12,058 tons by the United States Geological Survey. A total of 2,636 tons could be recovered by hand sorting.

ST. LOUIS—Production of zinc in the Free World during 1952 will be 2,418,000 short tons, according to an estimate made by Simon D. Strauss, vice president of American Smelting and Refining Company.

SEVEN ISLANDS, QUEBEC—The largest civilian airlift in the world is now in operation by the Iron Ore Company of Canada. Freight and passengers are carried to and between the 11 airstrips along the right-of-way for the 360-mile railroad to the Labrador-Quebec iron ore deposits.

SYDNEY, NOVA SCOTIA—The largest base metal mine in Nova Scotia—Mindamar Metals Corporation—has started production of zinc concentrates at its Stirling mine.

WASHINGTON—The National Production Authority has reported greater availability of zinc, vanadium, antimony, and lead. Nickel, cobalt, copper, tin, and aluminum supplies remain "most critical."

LONDON—The Southern Rhodesian and West African governments have granted gold producers the right to sell all their current gold output on the "Free Market." Previously, sales of only 40 percent of output had been permitted.

GRANTS PASS, OREGON—The General Services Administration has raised from 2,000 to 5,000 tons per year the amount of chrome ore it will purchase from one source.

SALT LAKE CITY—Production of copper during the first quarter of 1952 by Kennecott Copper Corporation was 305,000,000 compared to 297,000,000 pounds in the same 1951 period.

CLEVELAND—The Glidden Company and the Bohn Aluminum and Brass Corporation have joined research facilities to develop a cheap method of producing pure titanium metal, its compounds and alloys, and for the fabrication of ductile titanium and its alloys.

JUNE, 1952

[World Mining Section—21]

Court Rules L208-Damaged Gold Mines Can Sue U. S.

The United States Court of Claims has ruled that three gold mining companies have a right to sue the government for damages resulting from forced shut-downs during World War II.

By a unanimous decision, the court ruled that the Homestake Mining Company, The Central Eureka Mining Company, and the Idaho Maryland Mines Corporation were entitled to a trial to sue the government for possible damages resulting from the WPB Order L-208 issued on October 8, 1942 and commonly known as the "Gold Mine Closing Order." Basis for the companies' claims was that their Constitutional rights had been violated.

Indications point out that the government will not appeal the decision to the Supreme Court and that a compromise settlement will be reached between the companies and the government. The court will probably appoint a referee to take evidence and supervise settlements. The companies, of course, have their own detailed records and engineering reports to substantiate their damage claims. They are seeking restitution of damages only and do not claim any profits which might have resulted from normal operations.

The three companies repaired and rehabilitated their mines following the end of the war and resumed operations. Homestake with mines at Lead, South Dakota is the nation's largest gold mine. Central Eureka is the only major producer operating on California's historic Mother Lode, and Idaho Maryland is one of the largest gold producers in the Grass Valley, California district.

Uruwira Minerals Award Mill Contract to U. S. Firm

Uruwira Minerals Limited has awarded a contract to Southwestern Engineering Company of Los Angeles, California, for the engineering, design, and supervision of construction of the 1,500-ton-per-day mill Uruwira will install for the production of copper and lead from its Mpanda mine in Tanganyika. The plant will be ready for operation in January 1954. Development is financed in part by funds from the United States Mutual Security Agency, with the company supplying the remainder. Repayment of the loan will be in the form of copper and lead for the United States stockpile.

The incorporation of a SWECO Heavy-Media Separation unit is planned, which will make possible the rejection of about 50 percent of the mined ore as waste, reducing the concentrating section to a 700-ton-per-24-hour unit. A differential flotation plant will separate the copper from the lead. L. E. Daume, managing director of Southern Minerals Limited, the management agency for Uruwira, will spend several months in Los Angeles consulting with Southwestern engineers on the details of the project.

25

Baguio Gold Mining Company's new 400-ton-per-day cyanide plant, newest in the Philippines, was designed and erected by the Engineering Equipment and Supply Company, Inc. of Manila.



PHILIPPINE MINE OUTPUT INCREASES

Baguio Gold's new 400-ton-per-day cyanide plant, Acoje's 1,000-ton gravity chromite mill, and 150-ton copper flotation mill at Rapu Rapu are newest mills

Mineral production in the Philippines is still on the upswing with a total value, including nonmetallics, of Peso 116,680,421.00 for 1951, or Peso 35,310,140.00 more than 1950.

While gold production accounts for a little over Peso 44,000,000 of the total, the major interest is now in base metal mines especially copper and iron with the production value in pesos running about the same.

With the renewed operation of the iron mines in Marinduque and increases in production by the Philippine Iron Mines, Inc. in Camarines Norte, Luzon; Samar Mining Company, Inc.'s property on Samar; and the opening up of several other known deposits, the total iron ore production for 1952 should be in the neighborhood of 2,000,000 tons.

Lepanto Consolidated Mining Company is still the major copper reducer and accounted for a high percentage of the 1951 production. Hixbar Gold Mining Company, Inc., a prewar producer, is again in operation and will make several shipments during the year. Mindanao

Mother Lode Mines, Inc. is carrying on an extensive exploration program on the copper deposits at Toledo on Cebu, and several other companies are exploring base metal deposits in various parts of the islands. There are hundreds of known copper showings in the Philippines and it only needs an aggressive campaign to open them up.

Chromite holds third place in peso value of the base metals, with Acoje Mining Company, Inc. and Benguet Consolidated Mining Company accounting for the major portion. Production will show a marked increase during 1952 as Acoje gets its 1,000-ton-per-day mill in full operation; Benguet completes plans for increasing capacity at the Masinloc Mine, Zambales, Luzon to 50,000 tons per month; and Luzon Stevedoring Company starts exporting from its mine in Oriental Misamis.

Gold Mills Recover Base Metals

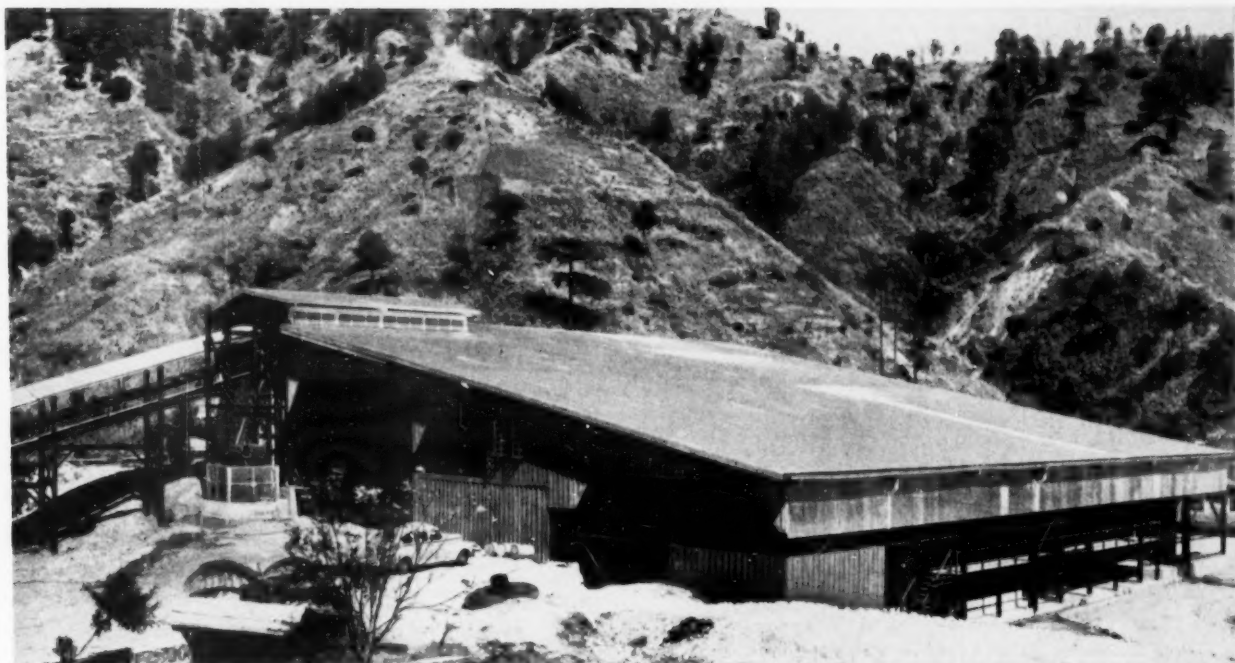
There will also be an additional increase in the base metal production because a number of the gold mills are being equipped with flota-

tion circuits for recovering copper, lead, and zinc.

MSA funds are being made available for the development of base metals throughout south east Asia which will give an impetus to base metal mining in the Philippine Islands. Recently, a loan of \$1,000,000 was made to Philippine Iron Mines, Inc. in MSA funds through several Japanese steel companies. These funds are to be repaid at the rate of \$1.00 per ton of ore shipped and are to be used for purchasing machinery and supplies and for development work.

Flotation Mill at Rapu Rapu

Arrangements have also been made by Nielson & Company with the Nippon Mining Company whereby Nielson will supply and install the necessary equipment for the installation of a 150-ton-per-day flotation plant at Rapu Rapu with fund to be repaid over a period of five years from production. A high-grade copper concentrate will be shipped to Japan and a high pyrite concentrate will be shipped to the Philippine National Power Cor-



poration's Maria Cristina fertilizer plant on Mindanao.

Venture capital is plentiful for the opening of new mines, especially in base metals, but there are still many handicaps to the mining industry, such as the tremendous shortage of technical men, the difficulty of obtaining supplies due to stringent import controls, and the difficulty of obtaining dollars.

Gold production, in spite of high operating costs, is still on the increase, but the peak of production has about been reached unless richer ore is found in some of the present operating mines. No new gold mines are being opened on a large scale but some of the pre-war mines, especially in the Paracale district, will again get into production and help strengthen the gold position; likewise, Baguio Gold Mining Company will add to the gold position when they get the new 400-ton mill in operation.

State Department's Ruling

Nestorio N. Lim, mining engineer and secretary, Chamber of Mines of the Philippines recently commented on the ruling of the United States Department of State as follows: "Gold mine chemicals, machinery, and spare parts have been given a priority rating of DO Number F-O-W4 by the United States government, which reduces Philippine supplies of needed goods to 50 percent of their 1950 consumption. There are those who believe that this defense order of the U. S. De-

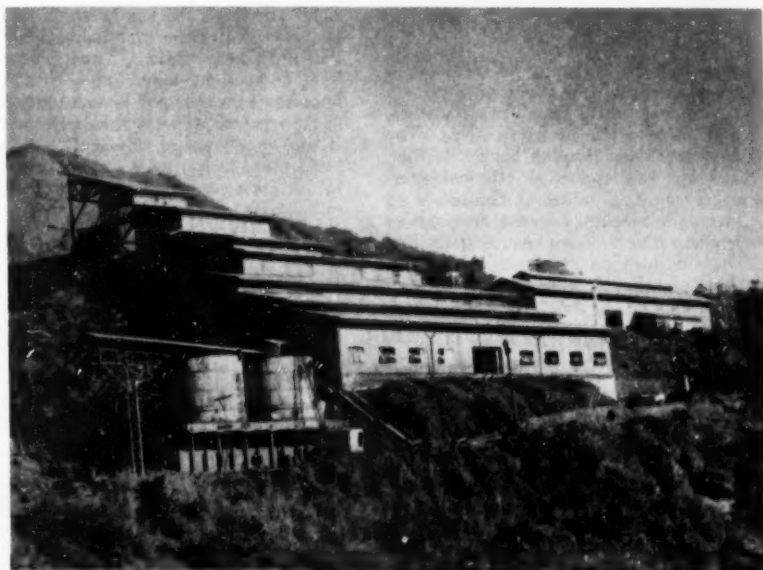
partment of State will have dire consequences affecting 1952 operation—will indeed result in the closing of mines.

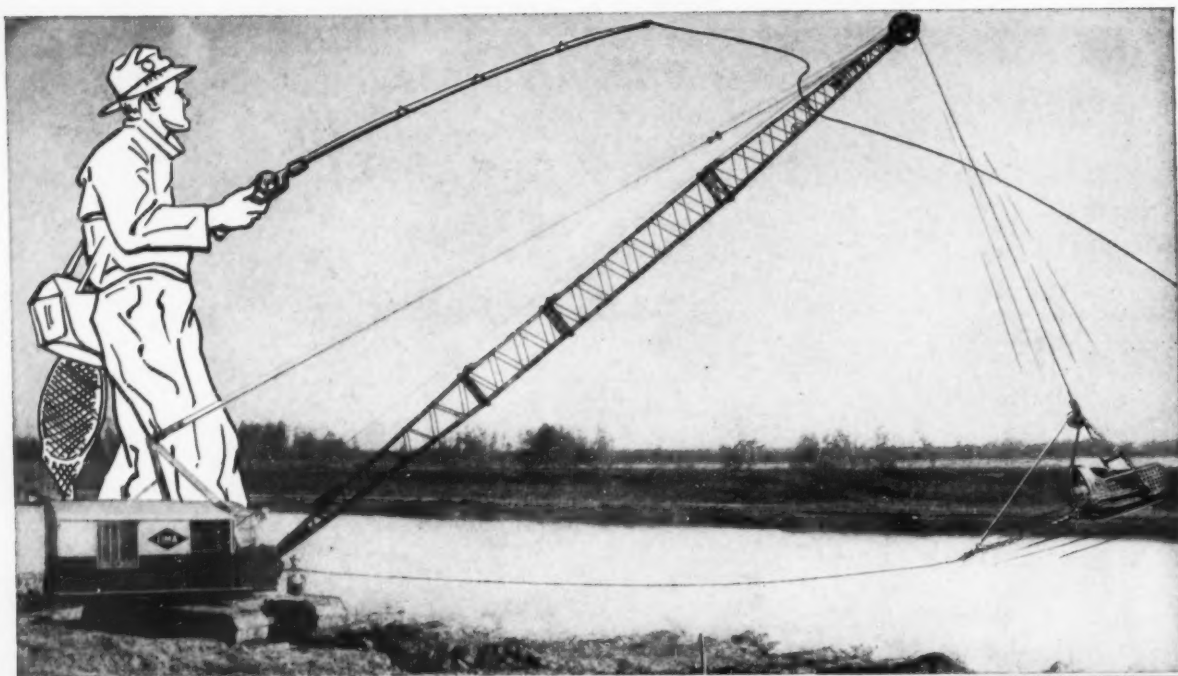
Gold Sells at Premium

The marketing of Philippine gold is still an uncertain proposition and it is impossible to make operating estimates upon a set price for the metal. According to law, 25 percent of the production has to be sold to the Central Bank of the Philippines at Peso 70.00 per ounce and the bal-

ance can be sold on the free market within the Islands. The price of gold on the free market during the first part of 1952 is ranging around 113 pesos per ounce which means that the producer, after selling 25 percent to the Bank, gets an average of 102.25 pesos per ounce. Regulations of the Central Bank require the reporting of all gold transactions; the price of the free market depends entirely upon the strictness with which this regulation is enforced.

The new 1,000-ton-per-day chromite mill of the Acoje Mining Company, Inc. near Santa Cruz, Zambales, Philippine Islands.





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The "Linde" JPM-1 Jet-Piercing machine "drilling" blast holes in Mesabi taconite. Hole piercing proceeds rapidly, at times as rapidly as 35 feet per hour.



By—

R. B. Aitchison
J. J. Calaman
D. H. Fleming

Development engineers, Linde Air Products Company

JET PIERCING COSTS CUT

New burners and improved techniques produce larger holes at greater speed with reduced fuel and maintenance on Erie Mining Co.'s taconite

Since the flame piercing of the first six-inch diameter vertical blast-hole 30 feet into East Mesabi taconite in August 1946, significant advances have been made in this revolutionary method of making primary blastholes in hard rock. To date, about six miles of blasthole have been produced, both experimentally and on a production basis, with the Linde Jet-Piercing process. This includes over 25,000 feet of hole made in 1950 and 1951 by the first production model Jet-Piercing machine, the JPM-1, for a 600,000-ton per year preliminary taconite plant at Aurora, Minnesota. In collaboration with the Erie Mining Company, owners of the machine, considerable

test work was accomplished during this time, particularly on new burners and new piercing techniques. This work has been successful with respect to improvement of process efficiency and reduction of primary drilling costs.

During 1950, a 20 percent improvement in process efficiency was achieved as a direct result of advances in burner design. A 6.5-inch hole, loadable with six-inch explosive, was pierced at the same rate of speed and for the same fuel and oxygen consumption as a six-inch hole loadable with 5.5-inch explosive in 1949. This permitted a 20 percent increase in tonnage per blasthole. Furthermore, burner life expect-



R. B. Aitchison



J. J. Calaman

tancy was increased nearly tenfold.

This article is devoted to the discussion of 1951 piercing results, development of more efficient burners, piercing of larger diameter blastholes, flame-tailoring portions of the blasthole to increase powder capacity, improvements in blasting practice, machine and blowpipe maintenance, process fluids distribution, features of the 1952 model Jet-Piercing machine built for the Reserve Mining Company, labor requirements of the process and operation safety. It is intended as a progress report, to up-date previously published material.

Table No. 1
Comparison of Jet-Piercing Results at Erie Mining Company
For 1950 and 1951.

Item	1950	1951
Hole size, average diameter inches	6.5	7.5
Hole size, average diameter inches	9.3	10.4
Average hole spacing in feet	17 by 19	20 by 24
Bench height in feet	25	25
Approximate breakage, tons per foot of hole	24.5	45.0
Average piercing speed, feet per hour	15.0	15.8
Cubic feet of oxygen consumed per foot of hole	660	664
Cubic feet of oxygen consumed per ton of taconite	27.0	14.8

From a paper presented at the University of Minnesota Mining Symposium, Duluth, Minnesota, January, 1952.



Changes in Jet-Piercing burner design. On the left is the dual-orifice burner used in 1949, on the right, the triple-orifice type used on the JPM-1 during 1951.

1951 Piercing Results

Developments during the past year have shown that:

1. The nominal 6.5-inch Jet-Pierced hole with an average diameter of 9.3-inches is equivalent to the 9.0-inch churn drill hole in terms of tons of rock produced.
2. The 6.5-inch pilot hole can be selectively enlarged by a second pass of the flame, using the standard burner, to produce an average 11.5-inch diameter wherever desired.
3. The 7.5-inch Jet-Pierced hole, which is 25 percent larger than the 6.5-inch hole, can be produced five percent faster and for approximately the same oxygen consumption per foot as the 1950 6.5-inch hole. Because of the increased hole size 25 percent more tonnage should be produced per blasthole.

Piercing performance for 1950 and 1951 is compared in Table No. 1.

The indicated 16 feet-per-hour piercing speed is based on an operation where half the piercing is done in the soft, partially decomposed taconite which does not spall as readily as the hard unaltered variety. Since it is likely that the East Mesabi taconites are predominantly of the hard, unaltered, consolidated type, piercing speeds will tend to be higher than the indicated average. This is evidenced by the fact that 6½-inch holes have been pierced at rates as high as 35 feet-per hour in the extremely hard areas. Improved burner efficiency permitted the seven percent increase in piercing speed, and improvements in utilization of the explosive capacity of the hole resulted in a 50 percent in-

crease in tonnage per blasthole when operating on a 25-foot bench with five feet of subdrilling. The net effect is a 36 percent piercing cost reduction per ton of crude.

During 1951 over 1,700 feet of hole were produced with 7.5-inch burners with very promising results. In fact, from the standpoint of explosive capacity and process fluids consumption, a saving was indicated over the 6.5-inch blasthole. A fair evaluation of the blasting characteristics of the larger hole could not be obtained because the relatively large hole spacing required by the large explosive capacity of the hole was impractical for the low bench heights (25 feet) currently being worked. However, it is estimated that on a 35- or 40-foot bench, with an approximate spacing of 23 by 27 feet or equivalent and a bottom load factor of two pounds of explosive per cubic yard, a primary breakage of about 50 tons per foot of blasthole could be achieved. In order to maintain acceptable fragmentation on these large spacings, it will probably be necessary to conduct extensive experimental work to determine, with reasonable certainty, the character of the upper material in respect to blasting requirements.

Over 1,140 feet of 7.5-inch hole pierced in the hard consolidated taconite proceeded at slightly over 18 feet per hour when burning 10-300 cubic feet of oxygen and 280 pounds of No. 2 fuel oil per hour. The 7.5-inch burner will be a standard item on the JPM-3 piercing machine being built for the Reserve Mining Company.

Can Selectively Increase Bore

The blasting characteristics of the rock are likely to vary from one

area of the pit to another, and it is likely that the full scale taconite operations will employ rail haulage in the pits. It is apparent, therefore, that a careful study of drilling and blasting methods must be made to arrive at the best combination of rock yield, displacement and fragmentation consistent with efficient and successful operation of loading and hauling equipment.

A feature of the Jet-Piercing process which should prove attractive in this respect is the ability to expand the bore, thereby increasing the explosive capacity of any portion of the blasthole. In tests, sections of the 6.5-inch blasthole have been enlarged to an average 11.5-inch diameter simply by making a second pass over the desired portion of the hole with the standard 6.5-inch burner at normal piercing speed. The test included a series of 6.5-inch pilot holes pierced at an average of 20 feet per hour. Immediately after piercing, the bottom 6.0 feet of each hole was expanded from an average 9.3-inches to 11.5-inches diameter by a 14-minute pass of the flame at normal fuel and oxygen consumption.

This large diameter at the bottom permits high load densities which should ensure maintaining grade and prove particularly advantageous in breaking the bottom in sinking or through cuts where the shot is particularly tight. This technique should also facilitate placement of deck charges where required.

Better Burners—Great Speed

In the continuing development work on the Jet-Piercing process, primary attention has been directed to improved burner design. Since 1949, burner construction has changed from a dual orifice, six-piece burner assembly of 300 feet of life expectancy, to a triple- and also quadruple-orifice, three-piece assembly of a proven life expectancy of at least 3,000 feet of blasthole. Wear and erosion of the burner are confined mainly to the orifice section. After about 3,000 feet of piercing, this section can be replaced for about half the cost of the original burner assembly.

The increased piercing speed achieved with the new designs resulted primarily from better placement of flame jets and more effective flame distribution over the bottom of the hole to accelerate the burning out of restrictions or necked-down portions of the hole. Longer burner life has resulted from:

1. Re-design of combustion chamber and orifice section with emphasis on streamline construction.
2. Re-design of coolant passages for better distribution and higher coolant velocity through chamber walls and orifice section.
3. Investigation of metallurgical treatment of copper forgings and castings to eliminate or combat high temperature corrosion and erosion of burner orifices by high velocity gases.

Most of the 6.5-inch piercing in 1951 was done with the triple-orifice burner. Seven and one-half inch holes were made with the quadruple variety burner.

Combustion pressures have been reduced from the 200 pounds per square inch in 1949 to about 50 in 1951 without reducing process efficiency. The lower burner pressures facilitate the use of low-pressure oxygen distribution systems.

Blasting Improvements

Prior to 1951, the Jet-Pierced blasthole was loaded and blasted using 5.5 and 6.0 inch can blasting agent. Actually the explosive charge utilized only 45 percent of the hole volume since average diameter of the blasthole is over 9.0 inches. Since Jet-Pierced holes are commonly wet, i.e., they may contain several feet of water, the commercially available free-running explosives could not be depended upon because of their lack of water resistance. However, with the advent in 1951 of a high-density, free running, waterproof blasting agent, utilization of the explosive capacity of the Jet-Pierced hole has been achieved. This improved blasting agent consists of hard, dense pellets, about $\frac{3}{16}$ -inches in diameter. The high specific gravity (1.6) of the individual pellets insures their sinking to the bottom in wet holes. The bulk density of this blasting agent is about the same as water.

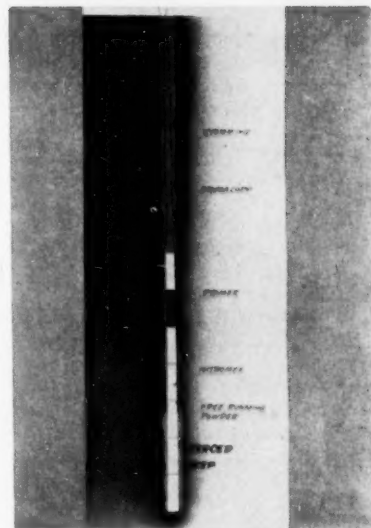
The loading of Jet-Pierced holes proceeds without difficulty. Current practice for shallow holes provides for lowering the desired number of 6.0-inch cans of blasting agent into the hole with a 5.0-inch primer near the top of the column. A double primacord is attached to the primer. The required quantity of free-flowing pellets is poured into the hole to fill the void around each can as it is placed until the entire column of cans is in position. The holes are stemmed and then detonated using either millisecond primacord connec-

tors or a millisecond blasting timer. Powder rise measurements on three primary blasts totaling 34 holes in which the free running pellets were used in conjunction with canned blasting agent, indicated an average load density of 46 pounds per foot of 6.5-inch blasthole.

It is important to point out that, with the deeper holes contemplated in eventual large-scale taconite operations, certain modifications of current blasting practice are recommended by explosives manufacturers. The present shallow holes are now loaded using only one primer with two branch lines of wire countered Primacord. Deeper holes would require two primers with a separate line to each. Two Primacord lines offer insurance against breakage from cans or rough stemming, but they should be initiated simultaneously to prevent the leading detonation from cutting the other cord at a certain critical separation distance and destroying the insurance factor provided by the second cord.

Equipment Maintenance

Marked progress has been made in improving the life of rapidly wearing parts during the past two years. Notable among these is the reduction in reconditioning cost and the increase in life of the hole sizer tips. Footage per reconditioning averaged 100 feet in 1951 compared to 67 feet in 1950, with the improved life due primarily to better design of hole sizer tips. Reconditioning costs were not only reduced by the longer life of the parts but also by the use of readily available low-cost ferrous alloys for hard-facing,



Loading of Jet-Pierced holes in Mesabi taconite. Lower section of explosive column is enveloped by the new waterproof explosive. Two detonating lines are used with the primer.

instead of the more expensive non-ferrous alloys containing cobalt and tungsten, both of which are in short supply.

The hole sizers are fabricated at the mine. In 1950, hole sizers were discarded because of abrasion and erosion after piercing about 1500 feet of blasthole. During 1951, their life has been increased to 1,800 feet of hole.

Wear also occurs in the exhaust system because of the abrasion from the through-put of two to five pounds of air-borne solids per minute. These solids constitute part of the cuttings which are ejected

This free-flowing, waterproof blasting agent was developed by an explosives manufacturer especially for the Jet-Pierced hole.



from the hole during the piercing operation. Wear occurs on the fan rotor, fan housing and intake duct. Fan rotor life has been increased more than three fold (from 2,000 to 7,500 feet of blasthole) by reducing rotor speed 20 percent. Rotor blades previously were 1/8-inch thick. Tests are now being made with 1/4-inch blades. The life of the rotor is expected to exceed 13,000 feet of blasthole. Rotors are reconditioned by installing new blades. The original fan scroll on the JPM-1 is still in service after 27,000 feet of blasthole; however, it has been repaired by welding patches in areas that were badly abraded. Recently, 1/4-inch thick high-carbon steel wear liners were installed, and it is expected that life of the scroll will thus be prolonged considerably. Erosion of the 20-inch diameter intake duct was more pronounced, requiring replacement of the duct after 25,000 feet of hole. The new duct made of 3/16-inch thick steel is double the thickness of the original and should yield about 40,000 feet of hole before replacement is again necessary.

The original turntable on the JPM-1 machine was designed for a hole size of 6.5-inches maximum diameter. In view of the trend to larger diameter holes, the table was found to be definitely undersize and too light for the job. Accordingly, the original was replaced after 20,000 feet of hole with a heavy-duty, rugged 10.0-inch turntable which is standard equipment on oil well drill rigs.

The sandblasting effect of cuttings being ejected from the hole during piercing results in erosion of the lower six feet of the Jet-Piercing blowpipe. The blowpipe is removed and this portion rebuilt to size by

hard-facing after about 10,000 feet of piercing. The job can be done by regular mine welders and requires about 48-man-hours. Approximately 30 pounds of mild steel and 30 pounds of hard-facing rod are needed.

As an additional measure to reduce wear on the blowpipe, motion of parts in the swing joint located at the top of the blowpipe (where the process fluids are introduced) and the turntable has been reduced, with the rotational speed of the latter being cut 60 percent. Blowpipe rotation is now normally six revolutions per minute with a higher speed of 18 available when required.

During 1949 and early 1950 several flashes occurred at the connections on the blowpipe swingjoint. Preventive measures taken at the time have eliminated this condition and there have been no occurrences during the past 16 months of operation.

1952 Jet Piercing Machine

A new model Jet-Piercing machine was recently shipped to the Reserve Mining Company's taconite operation at Babbitt, Minnesota. Designated as the JPM-3, this machine is equipped to make 7.5-inch blastholes up to 47 feet deep. This capacity should be adequate for handling the blast hole depths required for 35- and 40-foot benches. Basically, it has the same components as the JPM-1; but in the JPM-3 design, every effort has been made to eliminate or correct all mechanical, operating and maintenance deficiencies experienced on the earlier model.

The mast height has been increased to 64 feet to permit piercing

deeper holes. It is of a fuselage-type construction which permits a high strength-weight ratio. A ladder is provided to a crows nest located at the top of the mast to facilitate servicing of blowpipe, swingjoint, and head sheaves. The crawler type base has been made longer and wider to increase stability. Distance from center to center of tumblers is 13 feet. Operating width is 11 feet, 7 inches with provision for retracting to 10 feet, 3 inches for shipping. Each crawler is powered with a 25-h.p. electric motor with separate six-position drum controllers for speed control and the maneuvering and spotting of the machine.

The machine is equipped with a heavy-duty 18-inch turntable. The smoke- and steam-removal system has been isolated from the main cab to prevent fume leakage into the machine and facilitate maintenance. Specifications provide for a new type exhauster which has a lower replacement cost and is expected to have better wear resistance.

The cab is heated with a forced convection 10-kw heater. Roof and walls are insulated with one-inch thick Fibreglass. All electrical controls are located on the non-operating side of the cab. All motors are 440-volt, 3-phase, 60-cycle and totally enclosed where available. Fuel, oxygen, and water metering and regulating equipment are centralized at a location near the operator so that flow adjustments can be made quickly and easily. Size of oxygen piping in the machine and blowpipe has been increased substantially to reduce pressure drop and permit a maximum 125-pounds per square inch operating pressure. Water and compressed air lines have been placed near the cab ceiling to prevent freezing in subzero weather.

The JPM-3 is also equipped with the semi-automatic blowpipe feed control which has worked successfully on the JPM-1. This device will automatically perform, in a systematic and repetitive manner, all of the essential blowpipe movements performed in piercing by manual operation. It is the responsibility of the operator to maintain the optimum rate of blowpipe advance. This device should therefore permit higher machine efficiency because it eliminates the need for constant operator vigilance.

Process Fluids Supply

The problem of supplying process fluids, oxygen, fuel and water, to several piercing machines on a large taconite operation will require careful study. The most dependable dis-

The "Cascade" oxygen supply unit which supplies oxygen to the Erie Mining Company's JPM-1 Jet-Piercing machine at Aurora. Gaseous oxygen is stored here at high pressure and released automatically at lower pressures as needed.



tribution systems must possess great flexibility in coping with demand loads for the lowest capital expenditure and maintenance. Maintaining a dependable water supply, particularly in subfreezing weather, presents the greatest problem. The problem of supplying water for Jet-Piercing has been satisfactorily met at the small operation of the Erie Mining Company. The main water line is buried in the overburden adjacent to the pit, and insulated service lines are run to the piercing areas from convenient taps off the buried lines.

Since future large scale taconite mines will likely be long slender pits following the strike of the iron formation, pit lengths of several miles and widths of 2,000 to 3,000 feet may not be uncommon. Under these circumstances it is likely that the main water line will parallel the pit and be located outside the pit limits to obviate moving line as operations progress. To prevent freezing, it may be either a circulating line looped completely around the pit and laid on the surface or it may be an insulated line laid on the surface or be buried below frost line. If burying is not possible because of rock surface it may be covered with earth. The service lines might consist of single insulated lines to the piercing sites or looped lines containing a circulating pump.

Oxygen Supply

Recently, at the Babbitt property of the Reserve Mining Company, a Driox liquid-oxygen installation and oxygen pipeline was completed. Unlike the Cascade oxygen storage unit at the Erie mine, this system stores the oxygen as a liquid, gasifies it, and delivers the gas under pressure to the pipeline as needed.

Although operations at Babbitt will begin with one piercing machine to handle the blasthole requirements for a 900,000 ton per year pilot plant, both the pipeline and Driox unit have sufficient capacity for several piercing machines. The system will readily supply the large volumes of oxygen required and will permit great flexibility in demand loads. Liquid oxygen will be brought to the Driox storage unit either by tank car or tank truck.

Pipeline pressure is 165 pounds per square inch maximum in contrast to the 500 carried on the one-inch pipeline at the Erie mine. This eliminates the need for pressure regulators at the end of the service lines. The Babbitt system consists of a 6.0-inch main line about 750 feet long from the axis of the initial cut

and paralleling it. Every 1,500 feet a four-inch feeder line is tapped off to run within 150 feet of the pit. A three-inch service line parallels the pit at this point. The main is of welded construction. The feeder and service lines consist of 60-foot welded sections of pipe assembled with mechanical couplings or flanges to permit lengthening or shortening as required. The pipeline is laid on the surface and is supported every 20 feet on logs. Connection to the piercing machine will be made through 300 feet of 1½-inch hose.

Based on Erie mine experience in supplying fuel to the piercing machine both by tank truck and by pipeline and hose, it appears advantageous for the large scale operation to deliver fuel by tank truck.

Labor Requirements

Based on performance of the first production model piercing machine, it is estimated that the primary drilling requirements for a 15,000,000-ton per year taconite operation can be handled by six piercing machines operating three shifts. Labor requirements are estimated at 20 men per shift, including two-man operating crews per machine, process fluid supply and maintenance crews.

Thus far, Jet-Piercing machine operators have been former churn drill runners. It requires somewhat longer to train them than to train churn drillers; but the work is lighter and more pleasant because most of the operator's time is spent in a comfortable cab sheltered from the elements. Since process fluids constitute the major portion of the piercing cost, it is advantageous to select and train machine operators carefully to get the most out of a given expenditure of process materials.

Safety

Since the start of flame piercing work in 1946, no lost time accidents have occurred in connection with the process or machine operation. Pressure piping in the machine is equipped with approved safety devices.

Electro-mechanical interlocks shut off the burner flame instantly in case of water flow failure. Oxygen flow through the blowpipe cannot be initiated unless the water is flowing at a rate above a certain safe minimum. The fuel and oxygen passages in the blowpipe are bathed in a relatively large volume of water. Fuel and oxygen piping and hose are of different size to prevent interconnecting of the two lines. Work is in



The newest Jet-Piercing machine, the JPM-3, built for the Reserve Mining Company. It will be in operation at Babbitt, Minnesota in the spring of 1952.

progress on development of a semi-automatic igniter to eliminate the necessity of the machine helper igniting the burner with a long-handled, kerosene-soaked flare.

Some discomfort has been caused by leakage of fumes and steam into the main cab through the turntable mounting and exhaust fan housing. This has been partially corrected on the JPM-1 by sealing all openings in the floor of the machine and the turntable. In addition, the operator's cab is equipped with a blower to supply 200 cubic feet per minute of fresh air. On the JPM-3 design the turntable mounting has been improved to eliminate leakage in the exhaust system has been divorced from the main cab.

Cost Cutting Continues

Thus, the cost of Jet-Piercing and blasting per ton of crude have been materially reduced by improved burner design, automatic control of blowpipe advance, reduced maintenance costs, and improved blasting practice to fully utilize the volume of the Jet-Pierced hole. This trend will continue as further work is done on improved blowpipe control and on flame tailoring of blast holes to achieve the maximum breakage possible for a given bench height, consistent with good fragmentation. In addition, the high unit production, low labor requirements and reduced capital expenditure for drilling equipment and accessories should aid materially in cutting taconite mining costs.

The terms "Linde" "Cascade," and "Driox" are registered trade-marks of the Union Carbide and Carbon Corporation.

THE TSUMEB STORY - - PART II

TSUMEB MILL USES FIVE FLOTATION CIRCUITS FOR COPPER, LEAD, ZINC OXIDE AND SULPHIDE ORES

By J. N. Ong



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Mill superintendent



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This is the second part of a two-part series of articles prepared by the staff of Tsumeb Mines Corporation describing operation of its lead-copper-zinc mine and mill at Tsumeb, South-west Africa. The first part appeared in the May issue of Mining World and covered the mines' history, management policies, geology, and mining methods.—Ed.

The Tsumeb concentrator was originally designed to treat three separate ores in three separate grinding and flotation circuits. This design was made and the mill built before any underground ore could be tested, and the requirements for this ore determined. Continual developments have led to the use of two crushing circuits, one for low- and one for high-oxide ores, with separate grinding and flotation circuits following the fine crushing. The following description of the Tsumeb concentrator is concerned with current practice only, and the details of each section will show the difference in treating the high-oxide and low-oxide ores.

Crushing Low-Oxide Ores

The low-oxide ores are currently being drawn from below the 1,495-foot level in the mine.

The mine skips are dumped into a surge bin with a live storage of 125 tons. Ore is transported by a pan conveyor, of local make, to a 30 by 42 inch Birdsboro-Buchanan jaw crusher set at three inches. Discharge from this crusher is conveyed by a

36 and 24 inch conveyor system to a surge bin ahead of the Symons crushers. The low-oxide flowsheet shows details of this conveyor system.

Two stages of intermediate crushing are practiced using 4¼-foot Symons crushers on open circuit. Each crusher is preceded by a 4 by 8 foot, double-decked Lowhead screen for removal of fines. A mag-

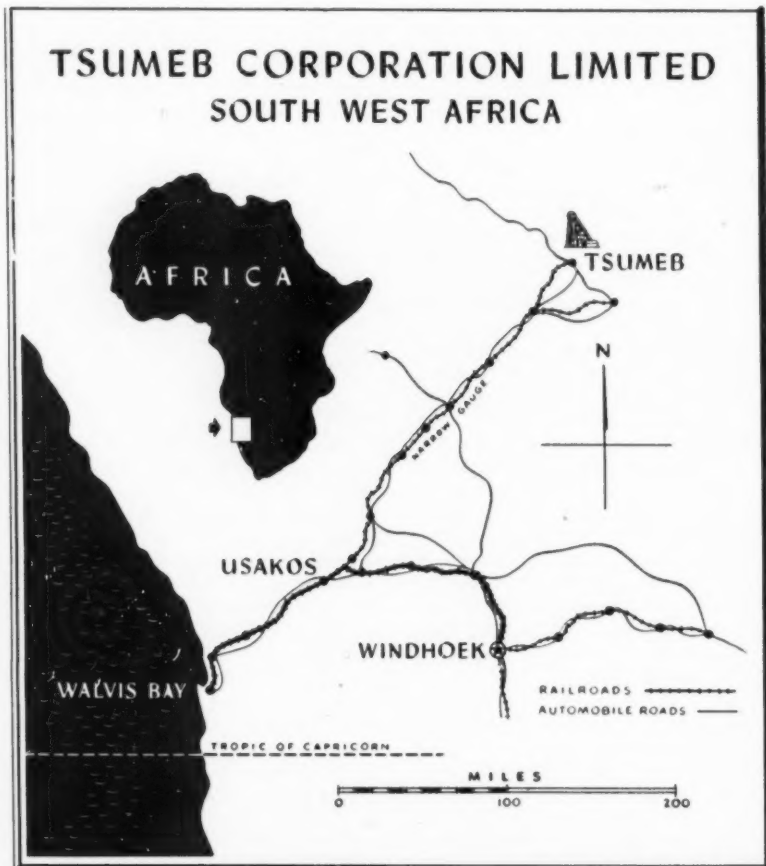


Table No. 2
Reagent additions by Points and Percentages in Low-Oxide Lead-Copper and Zinc Flotation Circuits at Tsumeb Corporation's Differential Flotation Mill

Reagent	Point of Addition	Percentage
LEAD-COPPER CIRCUIT		
Xanthate	Ball and rod mills	75
	No. 1 cell	5
	No. 5 cell	5
	No. 9 cell	5
	No. 17 cell	5
	No. 21 cell	5
	Cleaner	As required
Soda ash	Primary flotation head pumps	100
Cyanide	Six-foot classifier	58
	Pump box to No. 9 cell	29
	Pump box to No. 17 cell	13
	Cleaner	As required
ZnSO₄	Six-foot classifier	57
	Pump box to No. 9 cell	27
	Pump box to No. 17 cell	16
ZINC CIRCUIT		
Xanthate	Pump to conditioners	62
	No. 13 cell	20
	Middling pump box	9
	Cleaners	9
CuSO₄	Pump to conditioners	100
CaO	Pump to conditioners	90
	No. 1 cleaner	6
	No. 2 cleaner	4

net removes tramp iron. The primary Symons crusher is equipped with a medium bowl and is set at one inch, nominal, with 1 1/4- and 3/4-inch screen cloth on the Lowhead screen. The discharge of both the primary screen and crusher are conveyed to a surge bin ahead of the secondary Symons crusher. The secondary crusher is equipped with a fine bowl set at 1/2-inch, and the secondary screen is equipped with 1- and 1/2-inch screen cloth on the top and bottom decks, respectively. On both screens, the oversize from the two decks constitutes the feed to the respective crushers. The final crusher product consists of the discharge of the 1/2-inch screen and the secondary Symons crusher. These combined products are conveyed by a 24-inch conveyor to the fine ore bins and then distributed to five bins by a tripper conveyor.

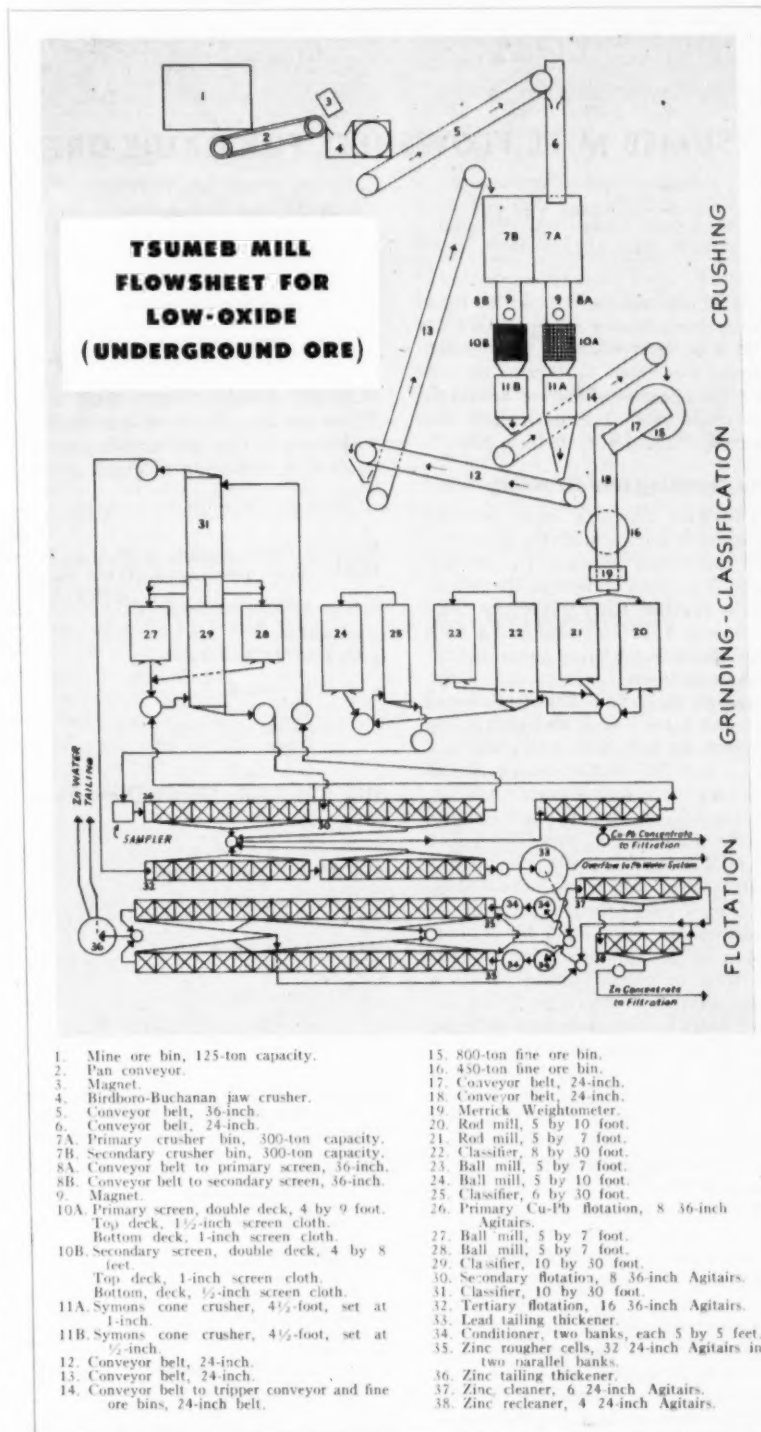
Crushing High-Oxide Ores

The high-oxide ores consist largely of surface dumps left by the previous operators of the mine. Currently, these dumps are transported by rail to a loading pocket and conveyed to a surge bin ahead of the jaw crushers by a 30-inch conveyor. The primary crusher is a 24 by 14 inch Krupp jaw crusher, with a 19 1/2 by 12 inch Krupp jaw crusher as a standby.

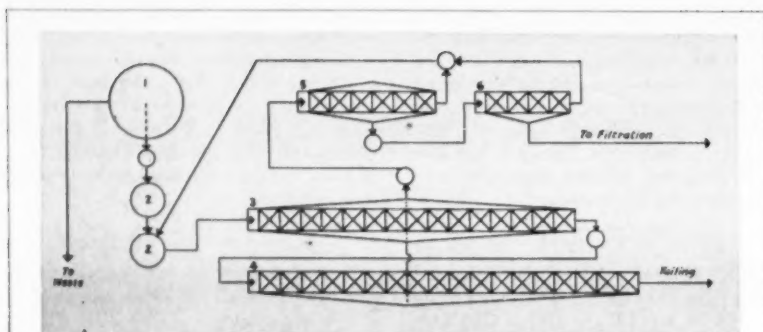
The jaw crusher is set to deliver a minus-6-inch product, which is conveyed by 24-inch conveyors to the

surge bin ahead of the secondary Symons crusher. Only one stage of Symons crushing is practiced on these surface ores. From this point both crushing systems (mine and dump ores) are the same, and the products are kept separate by discharging the tripper conveyor into the correct fine-ore bin.

For clarity, it should be explained that some high-oxide ore comes from underground and consists mainly of that ore above the 1,455-foot level. Such ore is crushed separately in the same system as that used for the low-oxide ore, but it is directed into a separate fine-ore bin by the tripper conveyor.



1. Mine ore bin, 125-ton capacity.
2. Pan conveyor.
3. Magnet.
4. Birdboro-Buchanan jaw crusher.
5. Conveyor belt, 36-inch.
6. Conveyor belt, 24-inch.
- 7A. Primary crusher bin, 300-ton capacity.
- 7B. Secondary crusher bin, 300-ton capacity.
- 8A. Conveyor belt to primary screen, 36-inch.
- 8B. Conveyor belt to secondary screen, 36-inch.
9. Magnet.
- 10A. Primary screen, double deck, 4 by 9 foot. Top deck, 1 1/2-inch screen cloth. Bottom deck, 1-inch screen cloth.
- 10B. Secondary screen, double deck, 4 by 8 feet. Top deck, 1-inch screen cloth. Bottom deck, 1/2-inch screen cloth.
- 11A. Symons cone crusher, 4 1/2-foot, set at 1-inch.
- 11B. Symons cone crusher, 4 1/2-foot, set at 1/2-inch.
12. Conveyor belt, 24-inch.
13. Conveyor belt, 24-inch.
14. Conveyor belt to tripper conveyor and fine ore bins, 24-inch belt.
15. 800-ton fine ore bin.
16. 450-ton fine ore bin.
17. Conveyor belt, 24-inch.
18. Conveyor belt, 24-inch.
19. Merrick Weightometer.
20. Rod mill, 5 by 10 foot.
21. Rod mill, 5 by 7 foot.
22. Classifier, 8 by 30 foot.
23. Ball mill, 5 by 7 foot.
24. Ball mill, 5 by 10 foot.
25. Classifier, 6 by 30 foot.
26. Primary Cu-Pb flotation, 8 36-inch Agitairs.
27. Ball mill, 5 by 7 foot.
28. Ball mill, 5 by 7 foot.
29. Classifier, 10 by 30 foot.
30. Secondary flotation, 8 36-inch Agitairs.
31. Classifier, 10 by 30 foot.
32. Tertiary flotation, 16 36-inch Agitairs.
33. Lead tailing thickener.
34. Conditioner, two banks, each 5 by 5 feet.
35. Zinc rougher cells, 32 24-inch Agitairs in two parallel banks.
36. Zinc tailing thickener.
37. Zinc cleaner, 6 24-inch Agitairs.
38. Zinc recleaner, 4 24-inch Agitairs.



TSUMEB MILL FLOWSHEET FOR OXIDE ORES

1. Bulk-flotation tailing dewatering thickener.
2. Two conditioners, 5 by 5 foot.
3. Oxide rougher cells, 15 Agitairs.
4. Oxide scavenger cells, 18 24-inch Agitairs.
5. Oxide cleaners, 6 cells.
6. Oxide recleaner, 4 cells.

Crushing is done on each of three shifts. Surface ores are crushed from 7:30 a.m. to 7:00 p.m. and underground ore from 7:00 p.m. to 7:30 a.m. European and native operators are responsible for inspection and clean up during noncrushing time.

Fine Crushing and Grinding

The fine crushing and grinding equipment consists of eight 5 by 7 foot mills and three 5 by 10 foot mills. Two 5 by 7 foot mills constitute a regrind section for the low-oxide ore with the remaining nine mills divided into three grinding sections as follows:

Section No. 1. One 450-ton fine-ore bin; one 5 by 7 foot rod mill using 2½-inch by 6-foot, 6-inch rods; one 5 by 7 foot ball mill in closed circuit with an 8 by 30 foot duplex classifier.

Section No. 2. One 450-ton and one 800-ton fine-ore bin; one 5 by 7 foot rod mill using 2½-inch rods; one 5 by 10 foot rod mill using 3-inch rods; one 5 by 7 foot primary ball mill in closed circuit with an 8 by 30 foot duplex classifier; one 5 by 10 foot ball mill in closed circuit with a duplex classifier; two 5 by 7 foot regrind mills in closed circuit with an 8 by 30 foot duplex classifier.

Section No. 3. One 450-ton and one 800-ton fine-ore bin; one 5 by 10 foot rod mill with 3-inch rods; two 5 by 7 foot ball mills both closed with an 8 by 30 foot duplex classifier.

Section No. 2 is currently being used to grind the low-oxide ore. In brief, the arrangement of this grinding circuit is to permit three stages of grinding and three stages of flotation, two stages of flotation being performed before the final grind is completed. It will be seen from the low-oxide flowsheet that the secondary tailing is reclassified in a 10 by 30 foot duplex classifier, the over-

flow of which goes to tertiary flotation.

Section Nos. 1 and 3 are straightforward grinding sections and are currently handling high-oxide ores. There are three fine-ore bins allotted to these sections and each is utilized to hold a separate ore making pos-

sible a uniform and steady tenor of ore to be fed to the flotation circuits.

Flotation-General Practice

The Tsumeb concentrator is a selective flotation plant with the main objective of concentrating the copper and lead minerals into a copper-lead concentrate and the zinc into a zinc concentrate. The low-oxide ore from underground responds normally to this simple conception and good recoveries are made of each metal in its corresponding concentrate, providing the oxide contents are not excessive, as little or no oxide mineral is recovered in this flotation section.

The high-oxide ores do not respond to the standard reagents that have been developed for separating zinc from copper and lead, and a special method of treating these ores has been developed at Tsumeb. This process involves a bulk-float for removal of the sulphide minerals of copper, lead, and zinc, followed by an oxide float of the bulk-float tailing for the recovery of oxide copper and lead. The bulk-float concentrate is further treated in a special circuit

Table No. 1
Reagent Consumption in Pounds Per Ton of Ore Treated in Low-Oxide, High-Oxide, Dichromate, and Oxide Flotation Circuits at Tsumeb Corporation's Differential Flotation Mill

Reagent	Consumption in Pounds Per Ton	
(A) Low-Oxide Circuit		
Xanthate, Z3	Lead Circuit	Zinc Circuit
NaCN	0.52	0.15
ZnSO ₄	1.34	—
Na ₂ CO ₃	1.28	—
CuSO ₄	4.91	—
CaO	—	0.50
Cresylic acid	0.14	4.19
(B) High-Oxide Circuit (Bulk Float)		
Z3	—	Bulk Float
Na ₂ CO ₃	—	0.42
Cresylic acid	—	6.60
(C) Dichromate Circuit		
Sodium dichromate	—	Dichromate Float
Reagent 610	—	5.70
Z3	—	0.33
(D) Oxide Circuit		
Z6	—	Oxide Float
Reagent 404	—	0.76
Na ₂ SiO ₃	—	0.28
Sodium sulphide	—	3.50
		4.50

Table No. 3
Specific Gravities and pHs at Key Points in the Low-Oxide, Lead-Copper and Zinc Circuits at Tsumeb Corporation's Differential Flotation Mill

Point in Circuit	Specific Gravity	pH
LEAD-COPPER CIRCUIT		
Primary classifier overflow	1.70	8.7
Secondary classifier overflow	1.40	8.8
Primary float feed	—	—
No. 1 regrind classifier overflow	1.22	—
Secondary float feed	—	—
No. 2 regrind classifier overflow	1.40	9.2
Tertiary float feed	—	—
Primary float tailing	1.24	9.2
Secondary float tailing	1.20	9.0
Tertiary float tailing	1.06	—
Pb-Cu cleaner tailing	—	—
ZINC CIRCUIT		
Zinc heads thickener underflow	1.64	—
Zinc rougher tailing	1.22	10.0
No. 1 zinc cleaner tailing	1.10	10.6
No. 2 zinc cleaner tailing	1.08	11.5

Table No. 5
Specific Gravities and pHs at Key Points in the High-Oxide Bulk Sulphide, Dichromate, and Oxide Flotation Circuits at Tsumber Corporation's Differential Flotation Mill

Point in Circuit	Specific Gravity	pH
BULK SULPHIDE CIRCUIT		
Classifier overflow	1.18	8.5
Bulk float tailing	1.14	8.5
Bulk cleaner tailing	1.04	—
DICHROMATE CIRCUIT		
Rougher tailing	1.20	8.5
No. 1 cleaner tailing	1.35	8.3
No. 2 cleaner tailing	1.23	8.3
OXIDE CIRCUIT		
Oxide heads thickener underflow	1.45	8.5
No. 2 conditioner	—	9.4
Oxide rougher tailing	1.17	9.5
No. 1 cleaner tailing	1.00	8.6
No. 2 cleaner tailing	1.13	8.5

where the copper and lead are depressed and the zinc floated, yielding as end products a copper-lead concentrate relatively low in zinc and a zinc concentrate relatively low in copper and lead. There are five flotation circuits in operation at the Tsumeb concentrator, and these are:

1. Low-oxide ore—copper-lead circuit—single-stage cleaning.
2. Low-oxide ore—zinc circuit—two-stage cleaning.
3. High-oxide ore—bulk-float—single-stage cleaning.
4. Bulk-concentrate-separation-circuit—two-stage cleaning.
5. Oxide circuit—two-stage cleaning.

Details of these circuits are described in the following sections.

No. 1, Cu-Pb Low-Oxide Circuit

Referring to the low-oxide flowsheet it will be seen that following the primary grind the first or coarse stage of flotation consists of a short treatment in a bank of eight No. 36, Agitair cells. The tailing from this bank is pumped to one of the regrind classifiers, closed with two 5 by 7 foot ball mills. The overflow of this classifier, still at a relatively coarse grind, constitutes the feed to the second stage of flotation in a bank of eight 36-inch Agitair cells. The tailing from this bank is reclassified in a 10 by 30 foot classifier, the sand being returned to the two regrind mills and the overflow proceeding to the final stage of flotation in 16, 36-inch Agitair cells.

All froth from cells in the copper-lead roughers is sent to a six-cell bank of 36-inch Agitair cells for single-stage cleaning, from which the cleaner tailing is returned to the regrind classifier, and the concentrate pumped to a 50-foot thickener ahead of filtration. Table No. 1 shows the reagents used in this section. The bulk of the depressants (zinc sulphate and cyanide) is added to the six-foot classifier in the primary grinding section and the remainder staged in the flotation circuit. All

soda ash is added to the pump box of the pump delivering pulp to the first stage of flotation. Some xanthate is added to the grinding mills, with the remainder staged throughout the flotation circuit as required. Currently, all frother is staged directly to the cells as required.

No. 2, Zn Low-Oxide Circuit

The lead rougher tailing is dewatered in a 70-foot thickener with the underflow constituting the feed to the zinc flotation circuit. The rougher section consists of two parallel banks, identical in every respect. Each bank consists of two 5 by 5 foot conditioners and 18, 24-inch Agitair cells. Thickener underflow is conditioned at 57 percent solids with copper sulphate, lime, and xanthate, then diluted so that rougher tailing is approximately 25 percent solids.

Froth from the first 12 cells from each bank is sent to two-stage cleaning, in a six-cell and four-cell ma-

chine. The froth from the last six cells of the roughers joins the cleaner tailing and is returned to the head of the rougher cells. Additional xanthate is added as required before the last six cells of the roughers and to each cleaner. Additional lime is added to each cleaner as required to maintain the pH at 10.6 to 10.8 on the first cleaner, and 11.2 to 11.4 on the second cleaner. The pH of the rougher tailing is held at 10.0 to 10.2.

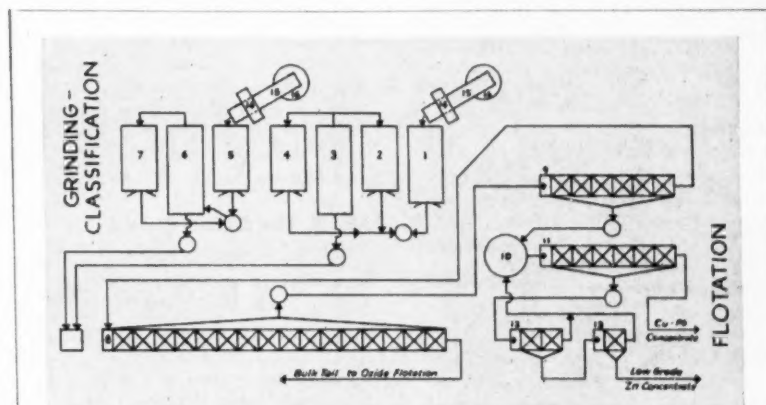
Zinc rougher tailing is dewatered in a 60-foot thickener prior to being pumped to the tailing dam, and the clear overflow water is returned to the zinc-water dam for reuse. The flowsheet and Table Nos. 1, 2, and 3 show details of this circuit.

No. 3, High-Oxide Bulk-Float

High-oxide ores from surface dumps and underground are ground in No. 1 and No. 3 grinding units and combined for bulk flotation in 16, 36-inch Agitairs. All the froth from these cells is sent to a six-cell machine using 48-inch Agitair impellers for single-stage cleaning. Cleaner tailing is returned to the head of the circuit, and the bulk cleaner concentrate is sent forward to the separation circuit shown in the high-oxide flowsheet with reagent data in Table No. 1.

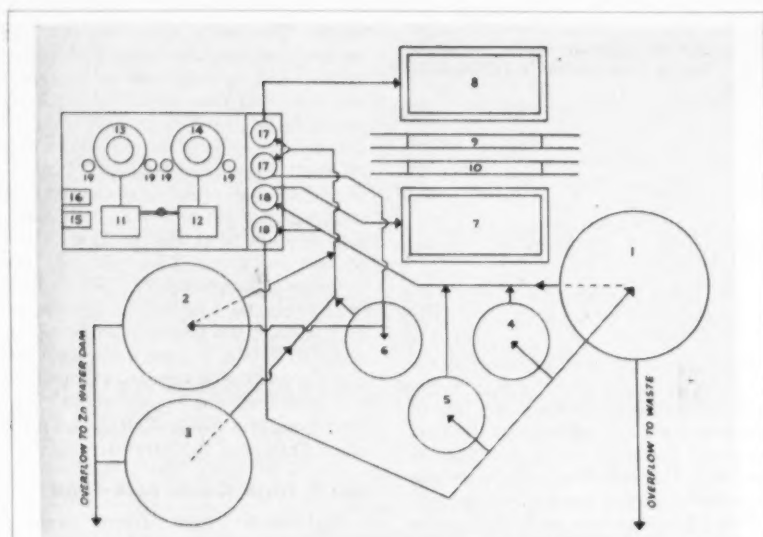
No. 4, Separation Circuit

The separation circuit consists of a 5 by 5 foot conditioner ahead of a six-cell bank of 24-inch Agitair rougher cells, followed by a two-cell, 24-inch Agitair. First cleaner tailing



TSUMEB MILL FLOWSHEET FOR HIGH-OXIDE ORE

- | | |
|-----------------------------------------|------------------------------------------------------|
| 1. Rod mill, 5 by 10 foot. | 10. Conditioner, 5 by 5 foot. |
| 2. Ball mill, 5 by 7 foot. | 11. Separation circuit, 6 24-inch Agitairs. |
| 3. Duplex classifier, 8 by 30 foot. | 12. Separation cleaner circuit, 2 24-inch Agitairs. |
| 4. Ball mill, 5 by 7 foot. | 13. Separation recleaner circuit, 1 24-inch Agitair. |
| 5. Rod mill, 5 by 7 foot. | 14. Merrick Weightometer. |
| 6. Duplex classifier, 8 by 30 foot. | 15. Conveyor belt, 24-inch. |
| 7. Ball mill, 5 by 7 foot. | 16. Ore bin. |
| 8. Bulk flotation, 16 36-inch Agitairs. | |
| 9. Bulk flotation cleaners, 6 cells. | |



TSUMEB MILL FILTERING PLANT FLOWSHEET

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Cu-Pb concentrate thickener, 50-foot. 2. High grade zinc concentrate thickener, 40-foot. 3. Low grade zinc concentrate thickener, 40-foot. 4. Cu-Pb concentrate storage tanks, 20 by 12 foot. 5. Cu-Pb concentrate storage tanks, 20 by 12 foot. 6. Zinc concentrate storage tank, 20 by 12 foot. 7. Cu-Pb concentrate filter, 14 by 16 foot Oliver. 8. Zinc concentrate filter, 14 by 16 foot Oliver. | <ol style="list-style-type: none"> 9. Weighbridges, Fairbanks-Morse. 10. Weighbridges, Fairbanks-Morse. 11. Vacuum pumps, 2 22 by 9 inch Ingersoll-Rand. 12. Vacuum pumps, 2 22 by 9 inch Ingersoll-Rand. 13. Filtrate and moisture trap assemblies. 14. Filtrate and moisture trap assemblies. 15. Blowers, Roots-Connerville 2 No. AF-610. 16. Blowers, Roots-Connerville 2 No. AF-610. 17. Zinc concentrate pumps, 2 3-inch Wilfleys. 18. Cu-Pb concentrate pumps, 2 3-inch Wilfleys. 19. Filtrate pumps, 4 2-inch. |
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Table No. 4
Reagent Additions by Points and Percentages in High-Oxide Bulk Sulphide, Dichromate, and Oxide Flotation Circuits at Tsumeb Corporation's Differential Flotation Mill

Reagent	Point of Addition	Percentage
BULK SULPHIDE CIRCUIT		
Xanthate	Ball and rod mills	75
	No. 1 cell	4
	No. 5 cell	9
	No. 9 cell	6
	No. 13 cell	6
	Cleaner	As required
Soda ash	Rod mills	100
	DICHROMATE CIRCUIT	
Sodium Dichromate	Conditioner	80
	No. 1 cleaner	11
	No. 2 cleaner	9
Reagent 610	Conditioner	90
	No. 1 cleaner	10
Z3	Rougher heads	As required
	OXIDE CIRCUIT	
NaSiO₃	No. 1 conditioner	100
	Sulphidizer	No. 2 conditioner
No. 16 cell		10
Z6		No. 1 cell
	No. 16 cell	22
404	No. 1 cell	65
	No. 16 cell	35

and a single-cell, 24-inch Agitair recleaner rougher tailing are the copper-lead concentrate. The recleaner froth yields the zinc concentrate. Sodium dichromate and reagent No. 610 are the depressants used in this circuit and are mainly fed to the conditioner, with minor amounts to the cleaners. Occasionally, xanthate is required in this circuit, depending on the activity of the zinc. The high-oxide flowsheet and Table Nos. 1, 4 and 5 show details of this circuit.

No. 5, The Oxide Circuit

The bulk-float tailing is dewatered in a 50-foot thickener to 50 percent solids, with the overflow going to

waste. The underflow is conditioned in two, 5 by 5 foot conditioners with sodium silicate and sodium sulphide.

The rougher flotation equipment consists of 15 cells equipped with 36-inch Agitair impellers, followed by an 18-cell bank of standard 24-inch machines. All froth from these cells is cleaned twice in six-cell and four-cell banks equipped with 36-inch Agitair impellers.

The recleaner concentrate is pumped to the same thickener as the copper-lead concentrate produced in the low-oxide circuit.

The collectors used in this circuit are reagent 404 and amyl xanthate. The oxide flowsheet and Table No. 1 show the details of this circuit.

Filtration

The high- and low-grade zinc concentrates are dewatered in two, 40-foot thickeners. A 50-foot thickener is used for the combined copper-lead concentrate. Two, 14 by 16 foot Oliver filters are available for filtering, with two, 22 by 9 inch Ingersoll-Rand vacuum pumps. Both filters can be operated by either vacuum pump, and copper-lead concentrate can be handled in either or both filters.

As filtering is ordinarily done on day shift, immediate storage is provided by three Goldfields agitators 20 feet in diameter and 12 feet deep. Long-term storage is provided by various storage dams at the mine.

The filtered concentrate drops directly into railway cars which, in turn, are spotted on Fairbanks Morse Weighbridges. Each car that is shipped is pipe-sampled for metal and moisture content, these samples being combined to determine assays and moisture content of any ore shipment.

All mill control samples are cut automatically every 15 to 20 minutes. These samples are taken on a shift basis, and combined in the assay office for a 24-hour sample. A mill laboratory is also operated for quick determinations of lead and zinc. A full-time assayer is employed on each shift.

Table No. 7
Product Recoveries and Percentage Recoveries by Metals for Low-Oxide, and High-Oxide Ores at Tsumeb Corporation's Differential Flotation Mill

Product	Percent of Heads	Percentage of Total Metal		
		Copper	Lead	Zinc
HIGH-OXIDE ORES				
Heads	100.00	100.00	100.00	100.00
Lead concentrate	21.59	89.48	93.39	21.03
Zinc concentrate	7.24	3.93	1.62	66.73
Tailing	71.17	6.59	4.99	12.24
LOW-OXIDE ORES				
Heads	100.00	100.00	100.00	100.00
Total lead conc.	22.08	69.75	81.30	37.05
Lead concentrate, separate circuit	17.85	64.03	62.75	33.86
Lead concentrate, oxide circuit	4.23	5.72	18.55	3.19
Zinc concentrate	5.75	10.64	5.55	36.25
Tailing	72.17	19.62	13.15	26.70

Ultra-Violet Light

The zinc mineral at Tsumeb is one of the rare sphalerites that fluoresces under ultra-violet light. This fact has been of very great value in operation of the circuits in which zinc is separated from copper and lead. A line-operated, ultra-violet lamp is in continuous operation enabling operators to make frequent checks of the flotation conditions.

Automatic pH Recording

Accurate control of pH is of vital importance in most circuits in the Tsumeb concentrator. Equipment for this consists of two Model M. Beckman desk pH meters for routine checking of important stations. Two automatic recorders are in service—the first is a Bristol controller and recorder currently in service on the

second zinc cleaner of the low-oxide ore circuit; the second is a Brown Electronik strip chart potentiometer which is capable of recording six stations on a single chart. These stations are located at key points throughout the plant.

Density Recorders

Density recorders are in service in the grinding circuits to aid the mill operators in keeping steady density of classifier overflows. These instruments are not infallible, but they do give warning if the circuit is in a state of change, and they provide a record for the staff of any shutdowns or major upsets.

Pilot Tables

Laboratory Wilfley tables are used as pilot tables at various points in

the flotation circuits. They have proved extremely valuable in warning operators of sudden changes. Good operators can nearly forecast a tailing assay for the lead circuits by watching these pilot tables. Any drastic change in the circuit is reflected at once on the pilot tables, whereas assays are available only at intervals of 1½ hours.

The accompanying tables give details of reagent additions, specific gravities, and pH's of the various circuits, and are self-explanatory.

Recoveries

Table No. 7 records the percent weight of heads in the various circuits and the recovered metal as a percentage of the metal in the heads. The figures shown are the average for a year's operation.

ELECTRIC POWER AND COMPRESSED AIR FURNISHED BY TSUMEB'S MODERN PLANTS

By C. A. Leslie

The original power plant operated by the former German operators consisted of Borsig steam-driven generators and a Deutz Diesel engine. This plant was antiquated and inadequate for Tsumeb's operations and the Borsig equipment was soon dismantled.

Power Plant

By September 1947, four Worthington Diesel engines (4 cycle) of 650 hp. each and directly connected to 600 kva, 500-volt, 50-cycle generators were in operation. Following the Worthington installations, two Hamilton Diesel engines (2 cycle) of 2,000 hp. each and directly connected to 1,790 kva, 2,400-volt, 50-cycle generators were installed and put in operation in May 1948.

Power, however, continued to be in short supply and the Diesel power plants were supplemented by installing two steam turbines and generators. The first of these turbo alternators is of Westinghouse manufacture and is being operated by means of a Babcock and Wilcox—FJ. 32—water tube Sterling Boiler of 35,000-pounds-steam-per-hour capacity. The rating of the Westinghouse turbo alternator is 3,125 kva, 2,400-volt, 50-cycle, excluding aux-

iliaries. The second turbo alternator is of Brown Boveri manufacture and is being operated by the same type and size Babcock & Wilcox Sterling boiler. The rating of the Brown Boveri turbo alternator is 4,000 kva, 2,400-volt, 50-cycle, excluding auxiliaries.

At the present time, the inherited German Deutz Diesel engine of 940 hp. is used as a stand-by. The generator rating of this machine is 880 kva, 500-volt, 50-cycle.

The total power plant capacity at present amounts to 13,985 kva which, at 0.8 power factor, makes available 11,188 kw.

Air Compressors

The steam-driven compressors operated by O.M.E.G. were no longer efficient nor capable of supplying sufficient quantities of compressed air. The corporation therefore installed two P.R.E. Ingersoll-Rand compressors of 2,150-cubic-feet-per-minute capacity. This installation was later followed by a Worthington compressor installation. The Worthington compressor is rated at 2,000-cubic-feet-per-minute. At the present time, a second Worthington compressor of the same capacity is on order.

The corporation has also placed an order for a 7,300-cubic-feet-per-minute, steam-driven, turbo com-

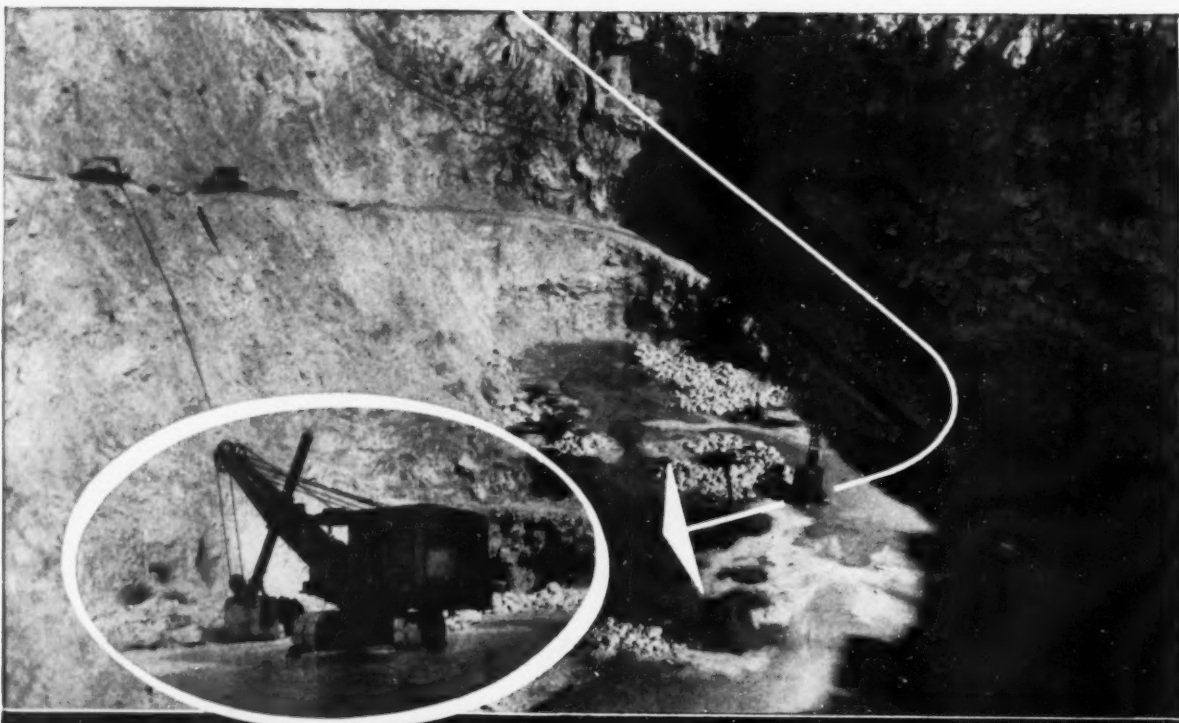


C. A. Leslie
Mechanical and electrical superintendent.

pressor with delivery expected in 1953. On completion of the installation of the two machines on order, the compressed air plant will have a total capacity of 15,600-cubic-feet-per-minute.

Workshops

The corporation operates its own mechanical and electrical shops, including a re-winding shop, for maintenance and equipment repair. All motor and generator re-windings are done at Tsumeb. The mechanical shop is subdivided into machine tool section, boiler and plate section, sheet metal section, pattern shop, cast iron and brass foundry, garage, design office, carpenter shop, and saw mill. All shops are equipped with the most modern machines and equipment obtainable. There is also an oxygen plant in operation.



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Philip Laylander holds an F-56 camera used for taking colored pictures from his Luscombe-BE monoplane shown in the background.



An aerial picture of Frency Canyon, Nevada taken by the New World Exploration, Research and Development Corporation. The firm uses small colored photographs in its work. Iron ore crops out just above the small road cut in center of picture.

HOW COLORED AERIAL PHOTOGRAPHS MAKE NEWEST ORE-SEARCH METHOD

By Philip A. Laylander
Geologist
Los Angeles, California

This article is a brief description of the methods and results of a five-year, basic research project in the Basin-Range Province of Nevada, Arizona, Utah, and southeastern California. The project was a search for methods of predicting ore loci below the surface of the ground, based on rock types, structure, hydrothermal alteration, and mineralization of a region and its contained mineralized districts. In other words, to use the sum total of information rapidly and economically obtainable rather than that indicated by scattered, superficial, surface-mineralization which has been the basis for most primary mineral exploration in the past. Valuable near-surface discoveries have been made by the methods developed, and it is anticipated that more important discoveries will be made when financing for sub-surface exploration (such as diamond drilling) becomes available.

The methods developed involve: 1. selection of 20 to 100-square-mile target areas by aerial reconnaissance; 2. aerial photographing of the areas

ABOUT THE AUTHOR

Mr. Laylander was graduated from the University of California in 1940 and shortly after entered the Army Air Force. In 1946, he went to Stanford University for graduate work in geology. Through the War Surplus Administration, he was able to purchase color film, aerial cameras, and processing equipment at a great saving, so he undertook a one-man research program to establish criteria and methods for effective mineral exploration. Recently, he obtained financing from a major copper corporation and studies based on colored aerial photographs of porphyry copper districts in New Mexico, Arizona, and Nevada are now under way.—Ed.

using large-scale, vertical stereoscopic, colored photographic methods (scale of 1:6,000 to 1:12,000, 60 percent endlap, 25 percent sidelap); 3. stereoscopic study of the color photographs, leading to a prediction of sub-surface ore bodies; 4. field examinations for the purpose of detailed rock and mineral study of critical situations. Under favorable conditions, it is possible to complete a geologic discovery in a few-days to a few-weeks time.

Criteria For Geologic Discovery

Such a geologic discovery is based on the maximum satisfaction of four criteria by a given location. The criteria are based on the observed, composite rock-structure-alteration-mineralization characteristics of doz-

ens of large and small mining districts by such aerogeologic methods, and subsequently checked by available information and field examination.

Besides conforming to the characteristics of known mineralized areas, the criteria also conform to certain theoretical systematic geology of the genesis of ore deposits developed chiefly over the past 20 years. (It must be noted that this field is highly controversial.) Some of the newer principles regarding structural controls, metasomatism, and geochemical factors appear to fit the observed field relationships well. It is not possible to cover this material in a short paper.

The four criteria for the location, analysis, and evaluation of sub-surface ore bodies are:

1. *Regional Uniqueness or Anomaly.* The most important ore bodies exist in situations of the greatest regional uniqueness or anomaly.

To determine the situations of greatest uniqueness, it has been found that a region can be divided roughly into parallelograms by a grid oriented to the major rock and structure features in which the various segments have a general uniformity or homogeneity of rock-structure-alteration-mineralization pattern within themselves; but differing from those of the surrounding segments. In the Basin-Range Province the reference grid lines run approximately NW-SE and NE-SW. The spacings of the grid lines vary, depending upon the complexity of the area; the NW-SE lines are from 5 to 30 miles apart and the NE-SW lines 10 to 60 miles. The grid follows to a large degree the present physiography of the region and can be conveniently sketched on the Civil Aeronautic Administration's Aeronautical Charts, which, with all their imperfections, are the best map coverage of the region. A better basis for spacings and directions of the grid lines is a modified structural contour map of the region in which the post-mineral geological activity (post-Miocene volcanic and block faulting) is removed. However, such a modified map can only be constructed from a rather lengthy study of a region. Such a map is not a necessity, as the present apparent regional anomalies or locations of uniqueness which include post-mineral activity are apparently quite similar to those existing at the time of formation of the ore bodies. The greater the differences between the rock-structure-alteration-mineralization patterns of the adjacent blocks (of the parallelogram grid), the greater the anomaly, and the greater the potential for important ore deposits.

2. *Extent and Grade of Hydrothermal Alteration.* Important ore deposits exist in areas of intense hydrothermal alteration.

It has been found that magmatic activity which is responsible for the origin of important ore deposits makes its presence known by alteration of a large amount of rock. Such large alteration aureoles exist in the important regional anomaly situations of Criterion 1. The extent and grade of the hydrothermal alteration depends upon the amounts and nature of the hydrothermal solutions derived from the magma, porosity, permeability, and reactivity of the rocks and minerals through which the solutions migrate, and the nature

of the fracture system of the area. The bulk of the alteration and subsequent mineralization is generally confined to one of the parallelogram blocks. The surface evidence of the amount and intensity of the alteration must be considered with reference to the geologic situation. A given amount and type of solution will not produce the same surface affect over a thick, flat-lying, relatively unbroken formation of limestone and shale, as over a coarse-grained, fractured crystalline rock, such as monzonite porphyry. The best (and perhaps the only) adequate basis for judging the relative amount and intensity of hydrothermal alteration effects is a comparative study of many geologic situations. Perhaps the best sources of information for such a comparative study are large-scale, vertical, stereoscopic, colored aerial photographs.

3. *Major Fracture Zone.* The important ore deposits are found along the largest fracture zones within the hydrothermal alteration aureole.

In complex geologic situations the determination of the major fracture zone is often difficult. However, it is generally in a fairly central location in the alteration aureole (which may be five to 10 miles across) and coincides with the greatest composite rock-structure-alteration-mineralization pattern change within the district. This can often be more readily and accurately determined with the color photographs than by ground examinations.

4. *Specific Mineralization.* Important ore deposits usually have some expression in (weathered) ore or protore mineralization overlying or up-structure from the ore bodies.

Within the rock-structure-alteration situation defined by Criteria 1, 2, and 3, is some scattered expression of weathered ore and protore mineralization. This may be only a fraction or a trace of the size of the ore bodies. To some degree, the concentration of silicification may be considered specific mineralization; to a larger extent, the remnants of pyritic and other sulfide mineralization is more diagnostic. In some instances—as in silver-lead-zinc deposits—manganosiderite halos are important evidences. It is these specific mineralization evidences which have been the principal bases for prospecting in the past. However, they are only of importance with reference to the maximum development of the three other criteria. This overall relationship has been neglected in the past and has been the reason for a

great deal of unprofitable prospecting and mining.

Ideal Perspective From Air

The estimates based on surface information must be modified to include the probable developments below the surface of the ground—the increases, decreases, or changes in the rock-structure-alteration-mineralization data present on the surface. Stereoscopic study of the large-scale, vertical, color photographs provides a very good basis for such estimates. Large enough areas including the features can be viewed in ideal perspective so that projections in depth are far easier visualized than when standing on the surface. The sub-surface developments of the larger features such as mountain ranges and their segments can best be estimated by flying a few thousand feet above and around them. This way, in one flight the possible and probable developments of the geologic features in the mountain ranges over several thousand square miles can be seen. Over a period of years the ability to make necessary estimates is considerably increased. Naturally, the better the estimates of the sub-surface developments, the better the basis for selection, analysis, and evaluation of ore deposit target areas.

Study with the color photographs of areas mapped in considerable detail by competent geologists often leads to new geologic discoveries. One of the reasons for this is the ability to compare directly one area with several others by means of the color photographs. This gives a broader basis for the determination of the relationships between similar rocks, structures, alterations, and mineralizations of the several areas.

Photos Yield New Data

On this basis it is often found that the geological conclusions in the published information are often open to doubt, even though the conventional ground work and petrologic and mineralogic studies have been very thorough. For example, crystalline rocks with similar mineralogic features may have had very different origins and histories through metamorphism and metasomatism. Comparative studies in the project have indicated that in some areas crystalline rocks which have been called tertiary granitic intrusives and the probable sources of the copper mineralization are quite possibly metamorphosed and metasomatized Archaean gneiss. Often structures which have been termed post-mineral have been found to be probably

pre-mineral by the intensification of the alterations and mineralization at places along them. Often fault relationships between rock units have been overlooked by conventional ground mapping, though they show up graphically in the stereoscopic photograph models. Sometimes this is very important when such faults are major, pre-mineral structures, and have acted as structural controls for emplacement of the ore. This is not meant to criticize the work of the mapping geologists but to illustrate the exploration possibilities with reexamination of areas by new methods and with new concepts.

The Airplane and Camera

In making the aerial photographs the author piloted a Luscombe-8E, 85hp, all-metal, high-wing monoplane. With 100 miles per hour cruising speed, 15,000 feet working altitude and 600 miles range, the necessary area could be covered very effectively and inexpensively. A fixed vertical camera installation operated by intervalometer was used. Camera used was F-56, which produces 100 to 120 7 by 7 inch pictures on a 75-foot roll of film. Using two magazines permitted photographing of 30 to 40 square miles per flight (at a scale of 1:6,000), which is adequate coverage for most mineralized districts.

100 Districts Air-Photographed

More than 100 western mining districts have been photographed in about 800 hours of flying time. These included most of the important districts such as Bingham, Tintic, and Eureka, Utah; Bisbee, Ajo, Jerome, Miami-Globe, and Superior, Arizona; and Pioche, Comstock, Tonopah, and Yerington, Nevada. Photographs of these districts provided most of the basis for the development of the criteria.

Besides the known areas, many undeveloped mineralized areas were photographed and studied. They have presented a number of potentially valuable ore targets. The examination of some of these in the field has resulted in ore discoveries in substantiation of the aerogeologic diagnosis and predictions.

It is not possible in this short article to give the details of the handling and use of the color photographs. The techniques follow those used with black-and-white aerial photographs as presented in *Aerial Photographs and Their Applications* by H. T. U. Smith; *Photogrammetry and Photogeology* by R. S. Helbing, Switzerland, and other publications.

Relative Colors Important

Regarding the photographic quality of the color air photographs, many factors in their exposure or development can cause them to register differently to the visual appearance of the ground. However, it is to a large extent those different representations on the color photographs which point out important alteration patterns which are very vague and indistinct to visual observation on the ground. The writer has used film more than five years old which has been refrigerated in hermetically sealed containers. The film shows some decrease in contrast, increase in grain, and changes in color balance; but it has been found more than adequate for analysis and evaluation of the rock-structure-alteration-mineralization characteristics of areas. It is more the relative color and tone changes between features in an area than the absolute and true color renditions which are of importance. Appropriate light sources and filters on the viewing table can be used to make the color photography more closely match the visual deter-

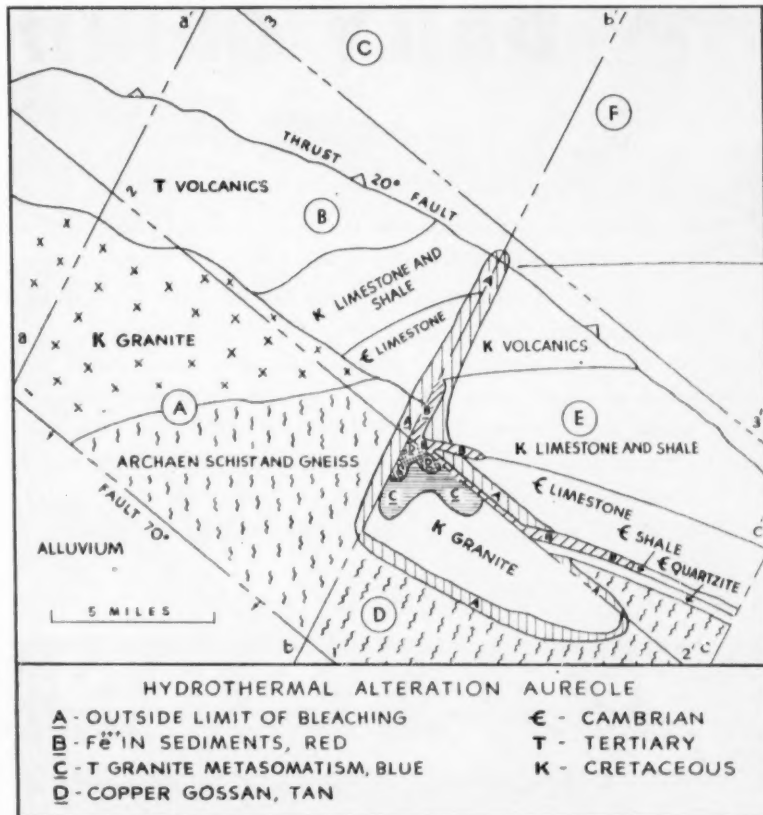
minations, or to emphasize the alteration and mineralization colors which are most important. Those are often the warm tones—the yellows, oranges, reds, and browns—but occasionally greens and blues.

Important in Unmapped Areas

The four criteria given in this article are empirical and can be used without recourse to the systematic geology of a region or mineralized area. However, it is probable that the more that is known concerning the systematic geology and ore occurrences the better.

The project has demonstrated quite clearly to the writer the great complexities and difficulties in the field of mining exploration—scientific, economic, and sociological. World trends indicate a strong desirability for this country to achieve a state in which discoveries exceed consumption of minerals. The discrepancy at this time is so great that it would seem to call for considerably expanded exploration activities and greatest cooperation between government, science, and industry to achieve that end.

Simplified sketch showing generalized rock-structure-alteration which satisfies the four criteria given in the article. The regional grid pattern (a, b, c, and 1, 2, 3) divides the area into blocks A, B, C, D, E, and F. The extent of the four general hydrothermal alteration features is outlined. Ore possibilities exist below the weathered zones in B and D. This is a general description of copper mineralization in southern Arizona.





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PILOT CONSTRUCTION

Section "AA", along the high-center wings. Section "BB", along the low-center wings.

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LOST MINES AND BURIED TREASURES LOST LEDGE OF TINAJAS ALTAS



In the year 1850 a small group of Mexicans, accompanied by a Franciscan priest, left the little town of Caborca, in the State of Sonora, Mexico, and headed for California. On the way they passed through what is now the southwestern part of Pima County, Arizona, for their first goal was a crossing on the Colorado River near the present town of Yuma, and then the trail that afterwards became known as the Butterfield stage route.

The group camped one night near Tinajas Altas, 70 or 80 miles west of the mining town of Ajo, and when morning came they found that some of the pack animals had strayed off. In an effort to locate the missing animals, one of the Mexicans climbed up the side of a small round hill to get a better view of the surrounding country. He had gone only a short distance when his attention was attracted by a showing of gold ore protruding through the sand piled up on the south side of the hill.

He stopped to investigate and found a vein about two feet wide and very rich in gold. Running along the hanging wall of the vein there was a streak of strawberry-colored quartz, seven or eight inches wide, that was matted with gold.

The Mexican noted well the sur-

rounding country to make sure that when he returned he could locate the vein. The hill on which he stood was small and round and the vein outcropped about one-third of the way up the south side. The vein ran in a northeasterly-southwesterly direction, and was being covered over by the drifting sands blown up from the desert below. To the west he could see Cabeza Prieta (Black Head) Mountain outlined against the sky.

He broke a few samples from the vein, then located the pack animals which had strayed only a short distance, and returned to camp. However, when the party started westward again, he left it and made his way back to Caborca.

There he interested a German soapmaker in the venture and soon was on his way to the mine, taking with him two Mexicans, a pack outfit loaded with provisions, and tools sufficient to work the mine.

The Mexican and his helpers made camp at a small spring some distance to the south of the mine, and built a small arrastre in which to grind the ore. When all was in readiness they made several trips to the mine, and each time returned to the arrastre with the pack animals loaded with rich gold ore.

Then disaster struck without warning. Three young Papago Indi-

ans appeared at the top of the shallow shaft from which ore was being broken and shot the Mexicans full of arrows before they had the slightest chance to escape. After making sure that their victims were dead, the Indians filled the shaft with sand and cactus, robbed the camp at the spring, and left the scene of their crime never to return.

Relatives of the three murdered men made several trips to the Tinajas Altas country, but were never able to find even the slightest trace of the missing miners or their mine.

Old "Doctor" Juan told this story when on his death bed, confessing that he was the sole survivor of the little band of Papagos that had killed the Mexican Miners some 70 years before.

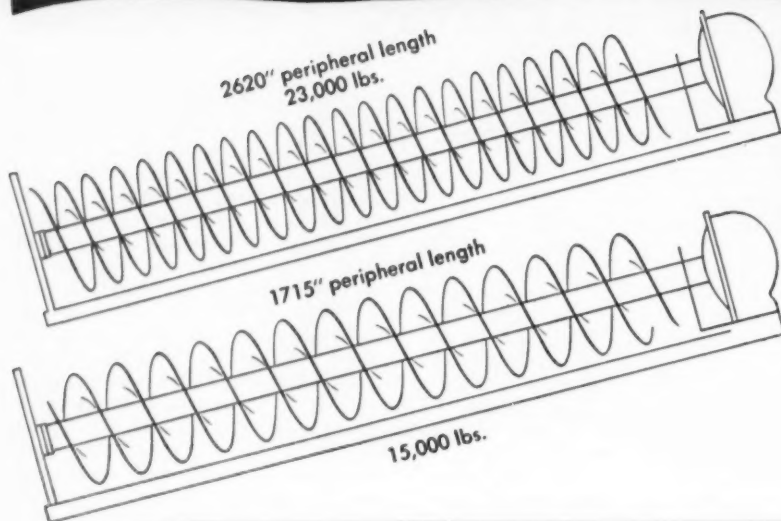
The gold which was recovered in the arrastre at the little spring is believed by the Papagos to lie buried somewhere near by. Rich float, in years past, was picked up by prospectors and cowmen in the country south of Mohawk and not far from a small round hill which resembled the one described by "Doctor" Juan.

Many expeditions have set out from Yuma and Ajo, in the intervening years, to search for this lost ledge. What the desert wind and sand storms cover up one year, may they not uncover the next?

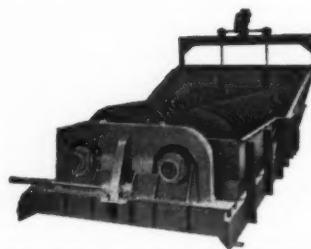
When all was in readiness they made several trips to the mine and each time returned to the arrastre with pack animals loaded down with rich gold ore.



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ACTIVITIES OF U. S. MINING MEN

David T. Marvel has been appointed as United States representative of the Copper-Lead-Zinc Committee of the International Materials Conference. He succeeds Myron Trilsch who is returning to private industry following service with the copper division of the National Production Authority. Mr. Trilsch had been acting U. S. representative during the absence of Frank H. Hayes, the original U. S. appointee to the IMC committee who has been on sick leave since the first of the

Charles R. Kuzell has been named general manager of Phelps Dodge Corporation. He was formerly assistant general manager. W. C. Lawson, assistant to the vice president and general manager, has succeeded to the title and duties of assistant general manager. The general offices for western operations of the corporation will continue at Douglas, Arizona.

Edwin C. Johnson has been appointed superintendent of the Enterprise mine, operated by The Hanna Ore Mining Company at Virginia, Minnesota. Mr. Johnson was formerly assistant general superintendent of the Wheeling Steel Corporation with offices in Virginia. Wheeling Steel recently discontinued its ore mining operations on the Mesaba Range.

Gordon M. Miner is now employed by Brannon and Patton, mine contractors, at Silver City, New Mexico. He formerly was mine superintendent for the Ozark-Mahoning Company at Northgate, Colorado.

M. Platisha who has been pit foreman at Pickands Mather & Company's Danube mine in the Canisteo district near Bovey, Minnesota, has been appointed general pit foreman at the company's new West Hill mine.

Niel R. Allen of Grants Pass, Oregon, has been reappointed as a member of the Governing Board of the State Department of Geology and Mineral Industries by Oregon's Governor McKay. Mr. Allen has served on the State Board since 1944 and now assumes a four-year term.

William R. Dice has been elected to the board of directors of the Eagle-Picher Company to succeed the late Vincent H. Beckman. Mr. Dice is vice president and comptroller of the firm.

CLARK B. CARPENTER, head of the Colorado School of Mines metallurgy department and well-known consulting metallurgist, returns to Golden, Colorado, this month after a visit to the British Isles. Professor Carpenter lectured at the Royal School of Mines and attended the national convention of the English Institution of Mining and Metallurgy while in London. He also made a survey of England's coal, smelter, and steel industries.



REJOINS MINING WORLD



HOWARD L. WALDRON has resigned his position as associate editor of the eastern mining journal, E&MJ, and has rejoined the staff of MINING WORLD as New York Editor and District Manager. Prior to his position with Engineering & Mining Journal, Mr. Waldron had held the position of Field Editor with MINING WORLD. His article on "Round Mountain Gold" (IMW June '50) won for MINING WORLD the 1951 INDUSTRIAL MARKETING First Place Award for the best article published by any business, trade or export publication during 1950. An honor graduate of the Montana School of Mines, Waldron has had a well-rounded background of civil and mining engineering. The broadened experience he has acquired in both western and eastern mining areas qualifies him well for his editorial and consulting work for MINING WORLD in the eastern area.

Russel B. Caples, manager of Anacoda Copper Mining Company's Great Falls, Montana, operations, was re-elected president of the American Zinc Institute for a second term. At the Institute's annual meeting in St. Louis, the following directors were also elected: W. C. Bennett, Phelps Dodge Refining Corporation; O. W. Bilharz, Bilharz Mining Company, Inc.; H. D. Carus, Matthiessen & Hegeler Zinc Company; C. M. Chapin, Jr., St. Joseph Lead Company; M. L. Havey, New Jersey Zinc Company; R. G. Kenly, The New Jersey Zinc Sales Company, Inc.; S. H. Levison, American Smelting & Refining Company; George Mixter, U. S. Smelting Refining & Mining Company; R. F. Orr, Athletic Mining & Smelting Company; and W. B. Porter, Hegeler Zinc Company.

Harry J. Wolf, mining and consulting engineer of New York City, was recently in the West on a survey trip. He examined some sulphur and mercury deposits in California, and some silver and uranium properties in Colorado.

Lenin Ramp has joined the staff of the Oregon State Department of

Geology and Mineral Industries. Last year, Mr. Ramp assisted Hollis Dole in geological mapping work in the Dutchman Butte quadrangle in southwestern Douglas County, Oregon, and this project will be continued by the two men during 1952.

Arthur S. Levor of New York City and Morton Hirsch of San Francisco, both directors of the U. S. Lead Corporation, recently toured the corporation's Superior mine at Montezuma, Colorado and attended the directors' meeting in Denver.

John A. Riddle of Duluth, Minnesota, who was with the Oliver Iron Mining Division in the Duluth research laboratory, has joined the staff of the Phelps Dodge Corporation at San Antonio, Texas.

Charles Segerstrom, president of Pershing County's Nevada-Massachusetts Company in Nevada, was elected president of the American Tungsten Association for two years at the recent convention in Reno. B. W. Voorheis of Gabbs, Nevada, and Roy Hardy of Reno were among the directors chosen.

B. C. Colcord has been reelected president of Woodward Iron Company in Birmingham, Alabama.

Oscar A. Glaeser, assistant to the vice president and general manager, has been promoted to assistant general manager of western operations of the United States Smelting, Refining and Mining Company. Mr. Glaeser has been with U. S. Smelting since 1936 when he joined the staff as safety engineer.

Clarence L. Karl has been appointed manager of the U. S. Atomic Energy Commission's Fernald, Ohio area to replace James F. Chandler. Mr. Chandler is rejoining the U. S. Corps of Engineers. His new assignment will be as Chief of the Construction Division in the Fort Worth, Texas district. Until his new appointment, Mr. Karl had been manager of the AEC's St. Louis, Missouri area. He will be replaced by Dr. J. Perry Morgan, who formerly was chief of the staff technical branch of the New York Operations Office Production Division.

A. H. Featherstone, J. A. Featherstone, H. F. Magnuson, George E. Grant, John Sekulic and C. E. Bloom have been reelected as directors of the

FELIX E. WORMSER (right), vice president of St. Joseph Lead Company, has been reelected president of the Lead Industries Association at its 24th annual meeting. J. A. MARTINO and K. C. BROWNELL have been reelected vice

presidents of the association, and R. L. ZIEGFELD has been reappointed secretary-treasurer.



Golconda Lead Mines in Wallace, Idaho. Walter Ely of Spokane was elected to succeed James Doyle, Jr. who has retired. The board reelected A. H. Featherstone as president and general manager; J. A. Featherstone as vice president; and Mr. Magnuson as secretary-treasurer.

Herbert Lorenz, president of South American Minerals & Merchandise Corporation in New York, has been in Japan developing his company's United States and South American interests in the Japanese market for metals, minerals, chemicals, and allied products.

E. C. Lampman is now at Oglebay, Norton & Company's Duluth, Minnesota headquarters office where he is manager of the company's Mesabi Range construction operations.

George W. Rust has joined the staff of Kennecott Copper Corporation

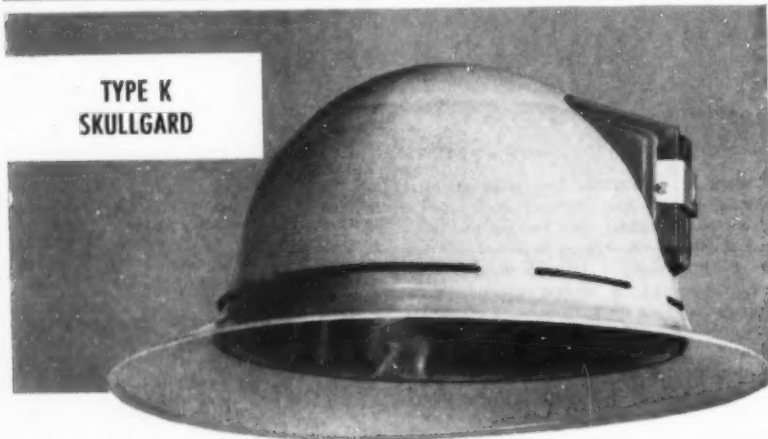
as geologist in the exploration department. For many years he was supervising engineer of the Mining Section of the Reconstruction Finance Corporation, stationed in San Francisco. Prior to that he had been in the geology department of Cerro de Pasco Company in Peru.

Dr. Zay Jeffries, Dr. E. K. Bolton, and J. R. Townsend have been appointed members of the recently formed committee on materials of the Department of Defense Research and Development Board. Dr. Jeffries, former vice president of the General Electric Company, was recently named a vice chairman of the Minerals and Metals Advisory Board of the National Academy of Sciences. Dr. Bolton recently retired as chemical director of E. I. duPont de Nemours & Company in Wilmington, Delaware. Mr. Townsend, materials engineer of

the Bell Telephone Laboratories, has been serving the Office of Defense Mobilization as consultant to the director on conservation of materials since January of this year.

Matthew L. Donachie, Maurice A. Hallam, Richard M. Quimby, and Daniel D. Schwartz have been elected At the reorganization meeting of the board of directors, Mr. Schwartz was elected chairman of the board; Mr. Donachie, president; William D. Gamon, vice president; and Mr. Quimby, secretary.

Arthur H. Bunker, president of the Climax Molybdenum Company, has been named a member of the Industrial Council recently organized at Rensselaer Polytechnic Institute. The Council was organized as a means of emphasizing the correlated interests of industry and society, pointing up the important role which industry holds in the economic development of the nation, on one side, and the responsibility which it assumes toward the consumer as well as the stockholder.



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Obituaries

Fred Wise, 45, general manager of the Idarado Mining Company at Ouray, Colorado, and of the Resurrection Mining Company at Leadville, Colorado, died May 1 in Denver. Mr. Wise spent most of his life in the mining industry, developing and managing a number of mines in California, Nevada, Utah and Colorado.

P. G. Spilsbury, 69, consulting mining engineer for Anaconda Copper Mining Company, died May 3 in Washington, D. C. Mr. Spilsbury spent a number of years in South America and Mexico before going to Arizona in 1917 as consulting mining engineer with Inspiration Consolidated Copper Company. He was widely known in Arizona for his work with the Arizona Industrial Congress, which he founded and headed as president, an organization which worked principally to bring new business into the state. Later, he was associated with Anaconda Wire and Cable Company and American Brass Company.

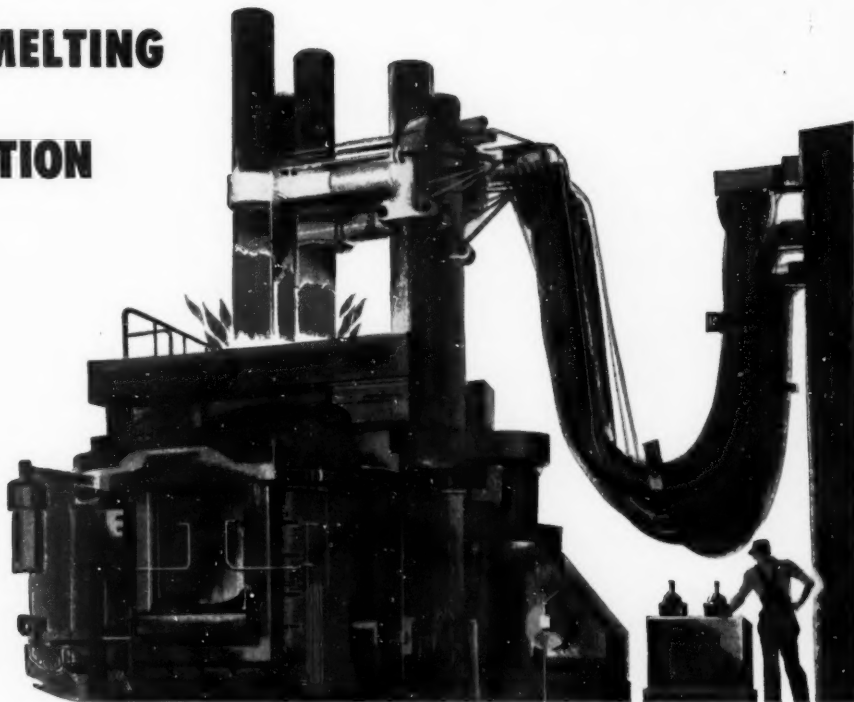
Harry Ingalls, 71, editor of "The Wallace Miner" in Wallace, Idaho from 1938 to 1948, died in Yakima, Washington, April 25. He was well-known throughout the Coeur d'Alene mining district and the northwest as a mining man and writer on mining affairs. In earlier days, he had also been on the staff of the "Mullan News" (Mullan, Idaho). For many years, he was secretary of the Copper King Mining Company and manager of its mining properties northeast of Mullan.

Joseph Henry Rodgers, one of Colorado's leading mining geologists, died in Boulder, Colorado, April 23. With his brother, Myron, Mr. Rodgers had been responsible for the early development of the Hidden Creek mine at Anyox, British Columbia, and the Nickel Plate mine, also in British Columbia. He had been active in mining in Colorado since 1922, and in Boulder County for the last 15 years. He was one of the owners of the Slide mine at Gold Hill. Recently he had been interested in a tungsten lease in the Sugarloaf district.

MINING WORLD

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35 years ago, the first Moore Rapid Lectromelt Furnace was put to work, setting the pace which established these furnaces as leaders in industry. Bold thinking throughout the years has maintained that position and, today, Lectromelt Furnaces are first choice internationally for all types of melting, refining, smelting and reduction.

From the automatic controls that guide the operation of a Lectromelt Furnace to its massive shell, Lectromelt Furnaces are built as production tools. Assembled and mechanically operated on the erection floor at Pittsburgh, they go together faster in

your plant, and you get into production with minimum delay.

Lectromelt Furnaces offer you rapid top-charging, high-speed melting, accurate control of quality and low-cost operation. They give long, trouble-free service and correspondingly low upkeep costs. We sell mighty few replacement parts; evidence of their durability.

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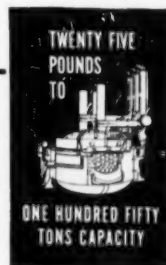
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WHEN YOU MELT...

MOORE RAPID Lectromelt

JUNE, 1952

[World Mining Section—37]



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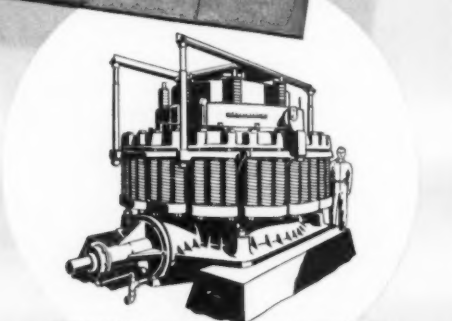
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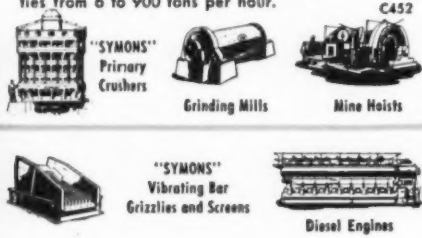


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ACTIVITIES OF INTERNATIONAL MINING MEN

D. H. WILSDON, chief metallurgist for Mount Lyell Mining and Railway Company, Ltd. in Queenstown, Tasmania, Australia, recently made a tour through the United States and Europe. Since Mount Lyell is considering the possibility of electrolytic smelting, Mr. Wilsdon particularly studied the operating practices of Scandinavian plants electrically smelting copper concentrate.



Brigadier General **Thomas B. Wilson** has been appointed Director of the Defense Materials Procurement Agency's Region III office in London, England. In his new post, General Wilson will direct DMPA's activities in all of free Europe, the Middle East, and North Africa, and will carry the personal rank of Minister. General Wilson has been a consultant to the General Services Administration and DMPA on matters relating to the agencies' defense activities since November 1950.

William Murray Keay, formerly a consulting engineer with offices in Madrid, Spain, is now Director of the Hong Kong Government, Department of Mines. He is a graduate of the University of Concepcion, Chile, school of mines and has had experience in South American and European mining fields.

Leo H. Saarela has resigned his position as Commissioner of Mines for the Territory of Alaska to become mining supervisor for the U. S. Geological Survey in Alaska. His new duties will include administering and supervising mineral leases in the territory. Appointed to succeed Mr. Saarela was **Phil R. Holdsworth**, well-known Anchorage, Alaska, mining engineer.

Dr. Victoriano Elicaño has been named the most outstanding Filipino engineer of the decade by the Philippine Society of Mining, Metallurgical and Geological Engineers. Also cited as outstanding in their respective fields were **Victor E. Lednicki**, mining executive; **Charles B. Foster**, mining administrator; and **J. B. Harrison**, mining engineer.

Sven Hjelmqvist, Swedish state geologist, has been appointed a professor in geology, specifically petrology and mineralogy, at the University of Lund in Sweden.

I. C. H. Croll, a senior mineral economist in the Australian Bureau of Mineral Resources, has returned to Australia after a visit to the U. S. A. and the United Kingdom. Mr. Croll was one of the Australian representatives at the International Materials Conference in Washington, D. C.

Robert Leonard, director of the Mines Et. Industries of Louzal, Belgium, was a recent visitor to the Shattuck Denn Mining Corporation's

Iron King mine at Humboldt, Arizona.

Tatsuro Shimamichi, chief of Japan's Itochu Shoki K. K. Metal Division, is in Italy to promote exports of Japanese iron and steel products to that country. **Hiroshi Akiyama**, acting chief of Nihon Kensetsu K. K.'s iron and steel department, has also been in Italy for the same purpose.

W. C. Snow has retired from the position of general superintendent of the Risdon works of the Electrolytic Zinc Company of Australasia, Ltd. in Tasmania, Australia. Mr. Snow has been succeeded by the former assistant general superintendent, **Noel S. Kirby**.

Nestorio N. Lim, secretary treasurer of the Philippine Chamber of Mines, is carrying on an extensive campaign to convince the Philippine administration of the necessity to protect and encourage the mining industry in the Islands. Mr. Lim is the former chief of the Mining and Metallurgical division of the Philippine Bureau of Mines.

Olof H. Odman has been appointed professor of mineralogy and geology at the Royal Institute of Technology in Stockholm, Sweden. Mr. Odman is a state geologist in Sweden. The Royal Institute has also appointed **Gudmar Kihlstedt** as professor in concentration.

A. H. Westergard, D. Ph. of Sweden, was selected as a foreign member of the Geological Society of London.

Mrs. Viola R. MacMillan was re-elected to the presidency of the Pros-

pectors and Developers Association at the annual meeting in Toronto, Canada, recently. It will be her ninth term in office, **J. J. Coghlan** is the new vice president, and **J. J. Rankin** is secretary.

Earl G. Schulz has accepted a temporary assignment as a consultant at the Murgul copper mine in Murgul, Turkey. He is on leave of absence from his position as smelter plant general foreman for the Kennecott Copper Company at McGill, Nevada.

Victor G. Ford is on a two-month vacation in England. He has renewed his contract with the Sinai Mining Company, Ltd. as general manager and will be returning to Egypt in June.

George Murray, mining superintendent of Lepanto Consolidated Mining Company in the Philippine Islands, has completed his three-year contract and is returning to the United States. **A. R. Reed**, assistant mining superintendent, will replace him.

P. A. Charsley, general manager of Norseman Gold Mines, N. L., in Western Australia, has returned to Australia after a two-month investigation of pyrite deposits and methods in the United States and Canada.

V. Gorsky, consulting mining engineer and metallurgist, has resumed his consulting work in Johannesburg, South Africa. During 1950 and 1951, he had been manager of the Incorporated Gold Mines Limited in the Pietersburg area of Northern Transvaal.



The Defense Materials Procurement Agency has created four new branches of its Foreign Expansion Division to deal with its mineral activities around the world. Chief of the South American Branch is **CARREL B. LARSON** (left), a mining engineer, who was at one time assistant general manager of Patino Mines and Enterprises at Catavi, Bolivia, and who spent many years as minerals attaché of the United States Embassies in Bolivia, Colombia, Peru, Chile, and Venezuela. **CLARENCE A. FREDELL** (second from left) is chief of the North and Central American Branch. He was formerly general superintendent of La Rica unit, Cia. Real del Monte y Pachuca at Pachuca, Hidalgo, Mexico, was with the San Francisco Mines of Mexico, Ltd. in San Francisco Del Oro, Chihuahua, Mexico, and was manager of the mining engineering department of E. J. Longyear Company in Minneapolis, Minnesota. **JAMES D. McCLINTOCK** (second from right), former mining engineer with Byrne and Byrne in Prescott, Arizona, has been named chief of the European and African Branch. **RUSSELL C. FLEMING** (right) is chief of the Far Eastern and Asian Branch. He has spent much time in the Philippine Islands where he helped to organize the Bureau of Mines and served as mining and safety inspector for the Bureau. The Philippine government later transferred him to the government-owned National Development Company as mining engineer. On leave of absence from the Bureau, he spent several months in North China where he inspected and examined anthracite coal fields at Mentoukou.



In Devils Den, "It stands up and takes it"

The output of the Culver Baer Mine—one of the richest Cinnabar ore mines in the world—is essential for the nation's defense program. Dependable equipment at the mine is essential for uninterrupted production. That's why this "Caterpillar" D7 Tractor with No. 7S Bulldozer is stripping overburden at Culver Baer in Devils Den Canyon, California.

"I have yet to see a tractor that can stand up and take it like 'Caterpillar' machines," says L. A. Hulbert, part owner of the mine. "Day in and day out, all our 'Caterpillar' equipment is ready to go."

Just as this sturdy yellow tractor roots out Cinnabar ore, other "Caterpillar" equipment is working doggedly in mines of every type in every section of the land. All mines need powerful, hard-working machines to cut costly down-time and to increase production.

This rugged equipment is as vital to the defense program as the minerals it mines. You can add to its lasting power by regular, daily maintenance. If you need service, your "Caterpillar" Dealer will provide it promptly and reliably.

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INTERNATIONAL NEWS

World's Largest Vertical Shaft Finished in O.F.S.

The No. 1 shaft of the Freddie's North Lease Areas, Ltd. in the Orange Free State has been sunk and concrete-lined to a depth of 5,973 feet at an estimated cost of £5,000,000. The rock excavation section of 700 square feet (14 by 50 feet) is the largest in the world. Dimensions inside the concrete are 11 by 47 feet.

The shaft was completed three years and four months after its start in November 1948. During 1949, the shaft was sunk 2,353 feet. The best footage during any 12 consecutive months was in 1949 and 1950 when approximately 2,600 feet were sunk, or an average of 216 feet per month throughout the whole period.

It took more than 1,000,000 bucket trips to sink the shaft, 500,000 loads of muck hoisted to the surface, and 500,000 trips lowering empties, men, equipment, and concrete to the bottom. Over 360,000 tons of rock were excavated during sinking, and 60,000 cubic yards of reinforced concrete lining emplaced. More than 4,000 steel dividers were used to support the 7½ miles of steel cables used for hoisting guides.

The mine manager, R. S. Cooke supervised operations, with C. J. Herschelman, master sinker, in direct charge of the sinking.

New Japanese Firm To Export Nevada Iron Ore

Kinoshita & Company, Ltd., the first Japanese corporation to be formed in California since World War II, has filed papers of incorporation in San Francisco. The new firm, associated with Kinoshita & Company Ltd. in Tokyo, will export iron ore to Japan from mines in Nevada. It will also import finished steel products from Japan.

ASARCO Ready To Develop Nigerian Lead-Zinc Mine

Two years of exploration work carried on by the American Smelting and Refining Company in Nigeria has produced encouraging results and underground exploration and development work will now be undertaken.

Several years ago, the Nigerian government granted the Mines Development Syndicate (West Africa) Limited a Special Prospecting License which covered an area of approximately 400 square miles in southeastern Nigeria near Abakaliki. The American Smelting and Refining Company made a lease and profit-sharing agreement with the Syndicate under which ASARCO would finance exploration and development, along with the cost of placing the property on an operating basis if an economic deposit were proven. Geological, geophysical, and geochemical investigations were conducted,

as well as surface trenching and a large amount of diamond drilling. The program has shown that lead-zinc ore exists, occurring in fracture systems in shale, with siderite the predominant gangue mineral. The lead and zinc contents are moderate; silver is present in small quantities; and gold is in negligible amounts.

If ASARCO's additional exploration and development results are favorable, a lead-zinc industry in Nigeria may be established for the Legislative Council of Nigeria has passed a Lead-Zinc Ordinance and an Aid to Pioneer Industries Act which is intended to encourage the creation of a domestic mining enterprise.

Increased Freight Rates Hit Mexico's Small Miners

Mexican miners are irked by further increases in rail freight rates. The government-administered National Railways, Mexico's largest railroad, has raised freight and passenger rates 16.66 percent. The increase was said to be necessary because of huge losses suffered in recent months. The Southern Pacific Railway of Mexico, operating from Nogales, Arizona, along the Pacific Coast to Guadalajara, Jalisco, was allowed to raise its freight and passenger rates 20 percent. The government has started to buy it on an installment basis and it is presently undergoing extensive rehabilitation.

The Southern Pacific's increased freight rates are a hard blow to small-scale miners in the region it serves. Many of these operators may be forced to suspend work unless the railroad can grant them special reductions for hauling their ore and other cargo. The railroad is the only means of moving ore to treatment plants and distribution ore centers from many isolated regions of the northwest.

The Mexican Mining Chamber and the large-scale mining concerns admit that the freight rate increase is necessary to rehabilitate the railroad and they also agree that the rehabilitation will eventually benefit an important sector of Mexico. There are only two major mining operators in the far-flung zone of the Southern Pacific. The Chamber has arranged for representatives of the Pacific Coast small-scale miners to meet with the management of the railroad and officials of the Ministry of Communications and Public Works to seek an answer to the situation.

Peruvian Firm Expands Tungsten Mine Facilities

Fermin Malaga Santolalla e Hijos Negociacion Agricola y Minera, S. A., of Lima, Peru has an expansion program underway at its tungsten mines.

The company received a credit last year of \$650,000 from the Export-Import Bank for the purchase of equipment and service, including an access road. The company also is under contract to sell to the U. S. Emergency Procurement Service all tungsten concentrates produced from January 1952 to June 30, 1958.

Peruvian production of tungsten concentrates for the first six months of 1952 is expected to reach 130 metric tons.

Expansion Goals Set For Copper and Phosphorus

An expansion goal for the production of 275,000 short tons of elemental phosphorus by January 1, 1955, and 2,270,000 short tons of refined copper beginning in 1955, has been set by the Defense Production Administration.

This goal represents an expansion of 114,000 tons over the 161,000 tons capacity of the elemental phosphorus industry on January 1, 1951, and allows for an expansion of 6,000 tons in production facilities in addition to those presently under construction or planned.

The goal also provides an additional 239,000 short tons of refined copper over the 1950 supply of 2,031,000 short tons. In 1950, the United States consumed 2,163,000 short tons of copper. By 1955, demand is expected to increase to 2,270,000 tons, including military, atomic energy and civilian uses, export and stockpile requirements.

Domestic production from present sources amounted to 921,000 tons in 1950. This production is expected to increase to approximately 1,000,000 tons in 1952, but, due to the depletion of some mines, it is expected to decline to 920,000 by 1955.

Prospecting Rights For Bethlehem Steel In Africa

The Bethlehem Steel Corporation has obtained prospecting rights to six large concessions in South West Africa and will prospect for iron and manganese ore, or any other metals. The three-year prospecting program is scheduled to begin in June. The areas to be explored are in the districts of Kaokoveld, Outjo, Windhoek, Swakopmund, Kectmanshoop, and Bethanie.

Mexican Mine May Be New Source of Cobalt

Shipments of ore from a possible new source of cobalt are being assayed at Douglas, Arizona, before being reshipped to Kennametal, Inc. in Pennsylvania. The two carloads of ore came from a mine 400 miles south of Douglas in the southern part of Sonora, Mexico. Ore had to be transported seven miles by burro before being loaded onto trucks which carried it to Navajoa 63 miles away. Cia. Minera de Alamos is the shipper.

The mine is not a new discovery. It was worked by the Germans from 1934 to 1939, but, in spite of the 500-foot explorations, they were able to extract only a small tonnage of cobalt ore for shipment to Germany. The present extractions are being made closer to the surface.

A promise of bigger things to come

This tiny machine was a forerunner of today's giant crushers. Built about 1875, it marked the introduction of mechanical means to reduce more material per hour.



The Traylor TC Gyratory, with its curved concaves and bell head, typifies advanced Traylor design for efficient operation. See Bulletin 126 for complete details.

Step by step, little machines and crude inventions have been developed into powerful, more efficient equipment to keep pace with the needs of a growing nation. For 50 years, Traylor has made it a policy to *lead* in the development and production of better machinery for the mining industry. In that time, mining men have come to depend on the skill and experience of Traylor to supply them with the tools they need. They know that when they consult Traylor, they consult experience . . . half a century of it.



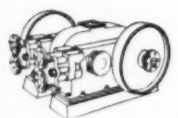
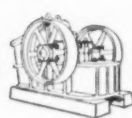
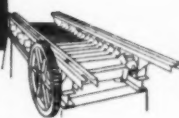
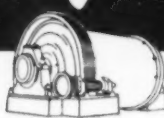
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FIJI ISLANDS REPORT ON MINERAL PRODUCTION AND OPERATIONS IN 1951

Recent increases in the price of base metals has revived interest in the Sawakasa district of Viti Levu Island in the Fiji archipelago. Some development work and diamond drilling is reported to have disclosed an ore body of sizeable proportions. Meanwhile, regular operations continue at Vatukoula in the Tavua Basin of Viti Levu Island, where gold is the chief mineral.

The geology of the Tavua district is similar to that at Cripple Creek, Colorado in regard to vein structures, in the presence of Tellurides, and in its relation to Tertiary igneous activity. Classified as an epithermal deposit, it can be regarded as typical deposition at shallow depths relatively close to the magmatic source. The lodes consist of veins in andesite dikes; "flats" make along fissures or ash beds extending on a low dip from the dikes; and in fillings along the cracks and fissures in the basaltic country rock adjacent to andesite dikes.

Three firms—Emperor Gold Mining Company, Ltd., the Loloma (Fiji) Gold Mines, N.L., and Dolphin Mines Limited—operate at Vatukoula as the Associated Mining Companies. The group is managed from one administrative office, with each company having a proportionate ownership in one power plant (No. 1 in the photograph below), a mechanical and electrical shop (7), a timber yard (5), and a central milling plant (4). Other key spots indicated in the photograph are the Wallace Smith shaft sunk by Emperor (2), an open pit (3), the churn and diamond drilling department (8), the Theodore shaft sunk by Loloma (9), the community store (10), the garage which was once the Loloma mill building (11), and the Eurasian social hall (12).

Mining methods include open pitting, as well as several types of underground stoping, particularly overhand cut and fill. Because the native miners are inexperienced, fill is introduced as a pulp. An extensive churn and diamond drilling program is being carried out on presently known ore bodies and on contiguous leases.

During 1951, the central plant treated 184,427 long tons, recovering 95,635 fine ounces of gold, valued at £F 1,324,567, and 24,869 fine ounces of silver, valued at £F 8,429. The milling process in use involves two-stage coarse crushing. This is followed by two-stage fine grinding to approximately 72 percent minus-200-mesh (Tyler); precyanidation (recovering up to 60 percent of the gold values); filtration, followed by flotation after conditioning of the pulp with sulphur dioxide gases from the roaster; and roasting of concentrates. Gold is precipitated by the Merrill-Crowe process.

In addition to gold and silver, numerous limestone and manganese deposits have also been located. Two quarries and burning plants, one owned by the Colonial Sugar Refining Company and the other by the Associated Mining Companies, supply total requirements for the Colony. Burnt lime produced in 1950 amounted to 2,207 tons, valued at £F 16,610 or \$18.64 per long ton. Figures for 1951 are not yet available.

Production of manganese in 1951 amounted to 2,800 long tons. The deposits are generally not very large and are accessible only at great cost.

Greece Will Send U.S. 100,000 Tons of Aluminum

Eleusis Bauxite Mines Sa. of Greece is preparing to start large-scale mining operations of bauxite at Eleusis.

The company, which is owned by D. Scalistiris, has signed a contract with the Mutual Security Agency calling for an advance of \$120,000 to be used for purchasing American machinery such as diamond drilling equipment, bulldozers, and compressors. The equivalent of \$133,000 in Greek and German currencies will also be advanced under the contract for use by the Greek company as working capital and for German equipment.

Under the contract the United States is to be repaid in the form of 100,000 tons of aluminum for the U.S. stockpile of strategic materials. The Greek company will deliver 450,000 tons of bauxite ore to Germany by 1954 where two companies will refine it into pure aluminum for final delivery to the United States.

The Eleusis Mine, situated on the bay of Salamis near Athens, has been the country's most active postwar producer. Bauxite from Eleusis averages 55-58 percent alumina, 28 percent iron oxide, 2.5 percent titanium oxide, and 1.3 percent silica.

The chief reason the ore will be processed in Germany instead of in the United States centers around the fact that Greek bauxites belong to the representative European type which are not adaptable to the process used in the United States and Canada for obtaining aluminum without radical modification of equipment. As such, Greek bauxites are characterized by their richness in diasporic or monohydrate ($Al_2O_3 \cdot H_2O$). This

compares with the trihydrate ($Al_2O_3 \cdot 3H_2O$) or tropical bauxite found in the Western Hemisphere, Asia, and Africa. The Greek bauxites, although of the same dark-red, ferruginous type as found elsewhere along the Mediterranean Coast, are more indurate or harder, and thus resemble the Rumanian bauxites.

Eleusis was the first Greek bauxite mine to return to postwar production, resuming activities in 1947 with an output of 23,500 tons. During 1948, it reportedly produced 100 tons of bauxite daily, but experienced difficulty finding buyers partly owing to a lower quality than most other Greek ores. Early in 1949, the management considered plans for constructing a new loading pier and for improved operating methods in order to reduce the ore-loading and other production costs. At the same time, the owner visited Germany to negotiate for the sale of future production. This has led to current plans for large-scale operations to meet the conditions of the new Mutual Security Agency contract.

To Double Production Of Electrolytic Manganese

An agreement which is expected to double present production of electrolytic manganese has been made by the Defense Materials Procurement Agency with the Electro Manganese Corporation of Knoxville, Tennessee, the country's only producer. Electrolytic manganese is a relatively new product and is 99.9 percent pure. Because it has none of the impurities of low-carbon ferromanganese, it can be used in place of nickel.

DMPA will advance \$2,250,000 to the company for the construction of a new plant. The Agency also agrees to buy, at a discount, up to 36,000,000 pounds of the metal from the new plant, providing the company cannot sell it at regular prices.

The company's present output is 7-200,000 pounds a year. The new production is scheduled for late 1953 or early in 1954. The contract will last for five years after the plant goes into operation.

Panoramic view of operations in the Tavua Basin on Viti Levu Island.



INTERNATIONAL



INDIA—In view of the world demand for manganese, *Shivrajpur Syndicate Limited* has taken orders for future sales amounting to 153,000 tons to be delivered in 1952 and 1953. The company is exploring the possibility of reopening the *Pani* mine for an estimated annual output of 12,000 tons. However, officials are appraising the current demand from the United States to see how much of it

is attributable to stockpile purchases only, and how much would continue as steady demand for private industry.

JAPAN—An agreement involving nearly \$4,000,000 has been made by a Canadian firm, *Aluminium, Ltd.*, with the *Nippon Light Metal Trading Company* whereby Aluminium will acquire 50 percent of the shares of the company and will provide technological and other assistance to develop production in Japan. Aluminium's bauxite concessions in India and mining rights in Malaya will be included in plans for enlarging raw material supplies for the Japanese firm, and it is also expected that Japanese hydroelectric power resources will be developed.

INDIA—The production of aluminium sheets and circles at the *Belur* rolling mill of the *Indian Aluminium Company, Ltd.* attained a record output in 1951. The mill will be redesigned and expanded to also turn out common and alloyed flats and coils. Orders for equipment and materials have been placed for this project and for expansion of refinery facilities at Travancore. The refinery's output will be increased from 2,500 tons per year to 5,000 tons. This has received the approval of the Indian government and additional power will be made available by 1954. The expansion program will cost about one crore of rupees. Half of it will come from the company's finances and the remainder will be a loan from *Aluminium, Limited* of Montreal, Canada.

JAPAN—According to Indo-Japanese trade circles, the Japanese Export-Import Bank is expected to finance imports of iron ore, copper ore, and other industrial raw materials to the extent of 2,000,000,000 yen (£2,000,000) during the current fiscal year. The bank will finance iron ore imports from India, copper ore from the Philippine Islands, and industrial salt from Thailand. A drop in the ocean freight rate recently will also enable Japan to import more iron ore and coal from India.

TIBET—Reports reaching Kalimpong, India from Tibet say that the Chinese have invited Russian technicians to supervise the building of roads and to develop gold, copper, iron, and coal deposits recently located. Tibet's first coal mine is already in operation and is located five miles from Shigatse. Tibet's second largest town. Coal is replacing scarce firewood and smokey Yak dung.

JAPAN—The *Light Metal Society* has estimated Japan's minimum requirements of aluminum for the fiscal year 1952-53 (April 1952 to March 1953) at 72,500 metric tons, comprising 46,000 tons of primary aluminum and 26,500 tons of scrap and secondary metal. These estimates do not include special demands which may arise because of the present plan for Japanese-American economic cooperation for defense production. Actual consumption in 1951 totaled 64,665 tons, of which 35,327 tons were primary aluminum and 29,338 tons scrap and secondary metal.

INDIA—A method for recovering fair amounts of nickel and zinc from waste effluents of silver refineries attached to mints has been developed by the National Metallurgical Laboratory at Jamshedpur. The method enables recovery of 60 to 70 percent nickel by electrolyzing the zinc-free liquor, using a nickel cathode and a stainless steel or lead anode. The recovered nickel has a purity of 99.22 to 99.34 percent. Nickel-zinc sulphide is obtained as a by-product which may be marketed for use as pigment or the metal may be recovered.

PAKISTAN—The Governor General, Ghulam Mohd, has made an appeal to private industry to come forward and share in the responsibility for the economic development of Pakistan. The Department of Geological Survey has speeded up the search for minerals and several deposits have been discovered since 1950. The lignite deposits of East Pakistan are among these. Development of existing mines has also improved, but the dearth of technical personnel and

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the poor means of communication in some of the mining areas have been limiting factors. The government is looking into these problems and would give due consideration to any suggestions which are made to them from any quarter for the development of their mineral resources.

TURKEY—Rich mines of various types are reported to have been discovered in Balikesir Province. Among them is a large deposit of boracite, found near the villages of Kalfa and Deredoy in the Susurluk district. Steps are being taken by the authorities to work the deposit.

ISRAEL—*Israel Mining Industries*, a government-owned company, is exploring for copper, manganese, and iron ore in the Negev. The copper and manganese ores are said to occur in an area north of Elath. Reserves of manganese are estimated at about 2,000,000 tons. Iron ore outcrops are sufficiently extensive to justify a more thorough geological survey and small-scale mining exploration. The Minister of Agriculture states that there are millions of tons of phosphate deposits in the Negev. Exploitation has started to produce phosphates for use as fertilizer.

JAPAN—Japanese steel shipments are scheduled for many countries this year. Under a recent contract with Great Britain 109,000 tons of steel and steel products are being shipped to the United Kingdom over a five-month period. First shipments were in March with 16,100 tons, 39,900 tons in April, 30,100 tons in May, with schedules of 18,900 tons in June, and 4,000 tons in July. A major portion of surplus steel will go to India in return for coking coal, manganese ore, pig iron, and kyanite.

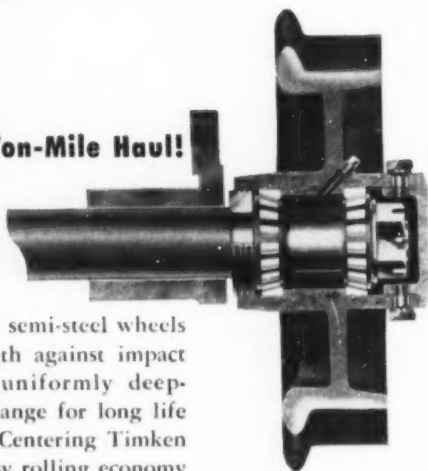
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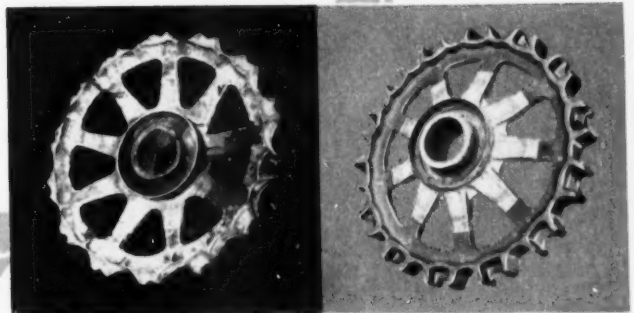


NORWAY—The Falconbridge nickel refinery at Kristiansand, South Norway has increased its production of nickel from 9,000 tons before the war to 14,000 tons this year. The plant has been expanded during the past three years. It is operated by *Falconbridge Nikkelverk*, the Norwegian subsidiary of *Falconbridge Nickel Mines, Ltd.* of Canada.

ITALY—No financing has yet been granted to the Italian sulphur industry out of the 9,000,000,000 lire appropriated by law last August for the promotion and modernization of the industry. Sixty-five applications involving a total of 16,000,000,000 lire have been received, but none have been approved by the special commission. Slow progress is also reported on the utilization of the 950,000,000 lire fund granted to the *Ente Zolfi Italiani*, the government agency in charge of sulphur output. The agency has not yet carried out any exploration work in the Marche and Romagna regions of Central Italy, but it does have 15 drilling outfits in operation in Sicily. Exploration work has been carried out in the Marche-Romagna area by the *Montecatini Company* with generally negative results.

FRANCE—The *Societe Nantaise des Minerais de l'Ouest* has resumed production of cassiterite from its concessions at Abbezret in Lower (Haute) Loire. The

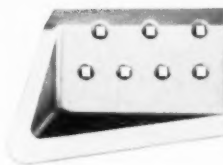
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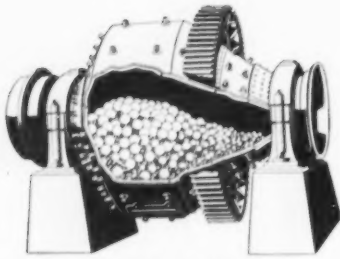
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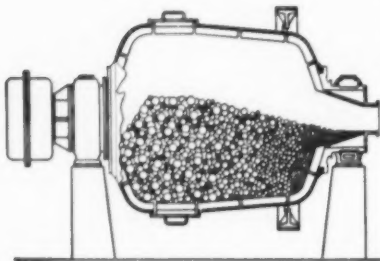
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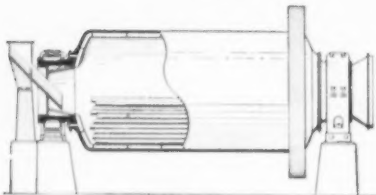
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firm has held the concession for a long time but has not been producing. Jean Petin is president and director general.

SWEDEN—The richest uranium deposit in Sweden has been discovered at Skovde near Billingen, Middle-Sweden, in a huge seam of "colm" (a bedded material similar to coal). Mining has not yet begun on a larger scale.

POLAND—The *Czestochowa Iron and Steel Works* has been renamed in honor of Boleslaw Bierut. A new Siemens furnace has recently been put into operation.

NORWAY—In April, 2,000 tons of slag were shipped from Kristiansand to a steel plant in Dusseldorf, Germany. Altogether, about 40,000 tons will be shipped to Germany. The slag is part of an accumulation of several hundred thousand tons from the nickel mines at Evje in southern Norway which closed down six years ago. The slag is said to have an iron content of 40 to 60 percent.

AUSTRIA—The *Johann Pengg* iron and steel works of Thörl near Alsenz is planning to set up a rolling mill in Montevideo, Uruguay to process semimanufactured iron and steel.

PORTUGAL—Many of the smaller wolframite mines are reported to be slowing down on production because they do not find the current prices sufficiently remunerative. The United States and Great Britain are currently paying \$60 a short ton unit and 485 shillings per long ton, respectively. During the first two months of 1952, Portugal shipped 637 tons of wolframite ore, compared with 470 tons during the same period in 1950. Of this, the United States imported 135 tons against 14 tons in 1951; Germany took 80 tons against only 17 a year ago; but Great Britain, normally Portugal's largest customer, imported only 250 tons against 412 in 1951. Under a recent French-Portuguese trade agreement, Portugal has granted licenses for the export of 267 tons of wolframite to France in the period up to June 30.

ENGLAND—Offices will be opened in London by the *United States Defense Materials Procurement Agency* to handle American purchases in Europe, the Middle East, and Asia. General Thomas Wilson, who was recently a member of the United States tin mission to Malaya and Indonesia, will be in charge.

YUGOSLAVIA—Two lead-zinc mines will start production next year, according to reports. Two new antimony flotation plants will be added this year to the two already in existence. Wolframite will be mined in Eastern Serbia by the end of the year and gold will be recovered as a byproduct of this and the new lead-zinc mines.

SWEDEN—The new sintering plant under construction at the *Boliden Mining Company's* lead foundry at Ronnskar in Middle-Sweden will increase lead production from the present 20,000 tons to 30,000 tons of lead per year. The sintering is done according to a new method enabling sintering of very high grade lead concentrates. The new plant will be completed in 1954.

GERMANY—The *Lumen* aluminum reduction works of the *Verenigte Aluminiumwerke AG.* expects to put its third electrolysis hall into operation this summer. This will increase present production of 1,700 to 1,900 tons monthly by from 600 to 900 tons.

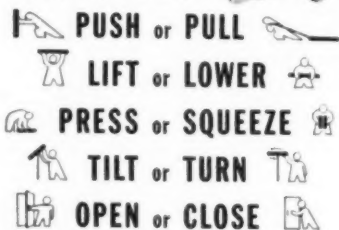
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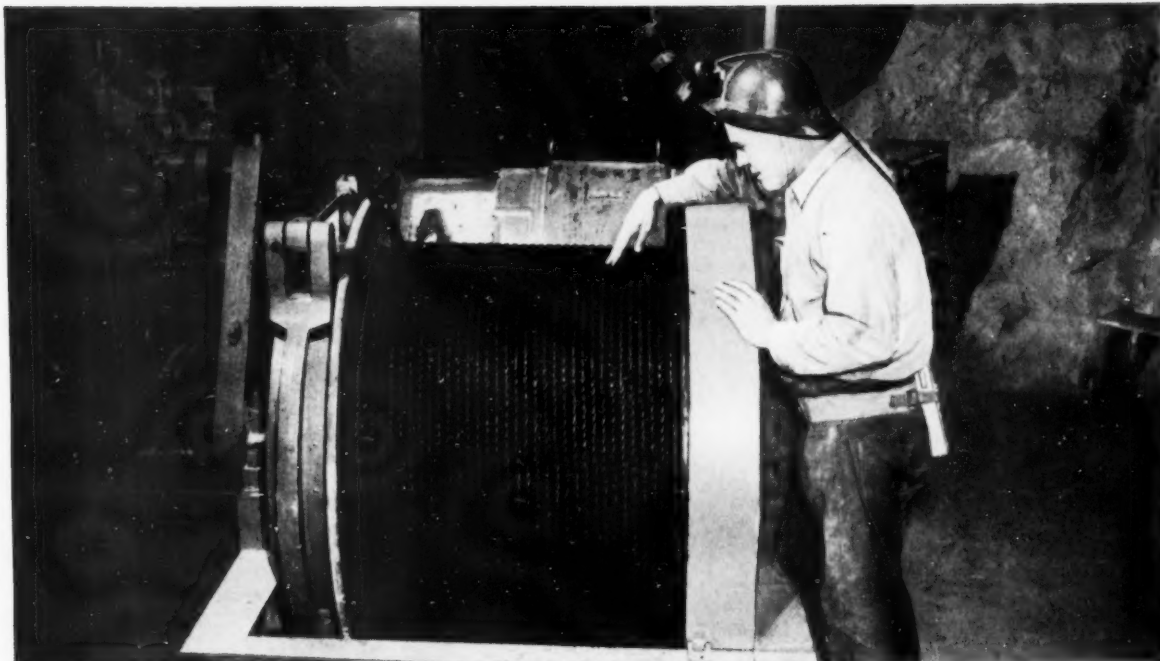
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UNITED STATES STEEL

INTERNATIONAL

placed an order through *Ore and Chemical Company* in the United States for a Wemco Mobil mill with a 6 by 5 foot drum separator to treat 30 tons per hour of lead-zinc ore.

SPAIN—The *Compania minera de Penarrayo* has started lead production at its mines in the Sierra de Lujar. Output of lead will be 2,000 tons per year.

AUSTRIA—Graphite production in 1951 amounted to 18,422 tons. Austria is reported to have the largest graphite deposits in Europe. The Austrian mining industry received \$820,000 in aid from the Marshall Plan for the period from 1948 until the end of 1951. This does not include the iron mines. The funds were

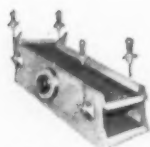
for the importation of machinery and the money was distributed to different industries in the country through the government. Suppliers of machinery have been West Germany, England, and the United States.

PORTUGAL—Under a recent trade agreement signed with France, Portugal will ship 600 tons of tungsten ore to France.

BRITISH ISLES—Although figures are not available yet, the production total for 1951 in fluorspar amounted to around 50,000 tons. The mineral continues to be worked at the *Masson* mine in Matlock, County Derbyshire, England, and at the *Glebe* mine, Eyam, Derbyshire.

SPAIN—Copper production in Spain is being augmented by the rehabilitation of many old abandoned mines. None of these mines is as large as *Rio Tinto* but together they should add several thousands of tons to the annual production total.

FRANCE—The sulphur bearing ore extracted by the *Societe Languedocienne de Recherches et d'Exploitations Minières* from mines in Malvezey have been transformed into 8,500 tons of sulphur. In 1952, the company hopes to raise this figure to 15,000 tons, which would cover eight percent of the quantity France needs.



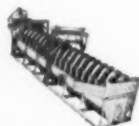
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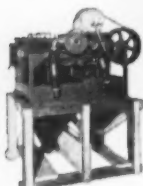
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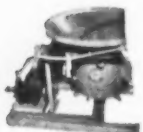
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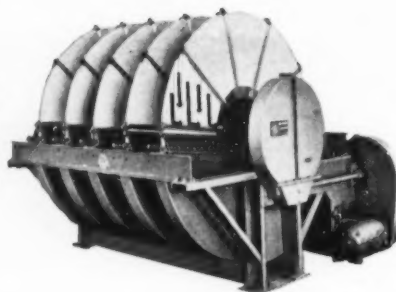
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OCEANIA

NEW SOUTH WALES—*Wellington Alluvials Limited*, a subsidiary of *Broken Hill Proprietary*, operates a gold dredge at Wellington. A serious breakdown has put the dredge out of production for about three months. Production of rutile and zircon concentrates in this state during 1951 more than doubled the previous year's figures. Tonnages were rutile, 23,060 tons in 1951, compared with 10,583 tons in 1950; zircon, 32,281 tons in 1951, compared with 15,030 tons in 1950. Major producer was *Zircon Rutile Ltd.*, operating on beach sands at Byron Bay.

PHILIPPINE ISLANDS—Production from *Consolidated Mines, Inc.*'s chrome mine at Masinloc, Zambales, increased steadily during 1951. This was the result of placing the washing plant on three-shift operation in the middle of the year, and adding trucks and men for the production of lump ore shipped directly to the wharf bins from the mine. Consolidated realized an operating profit of Pesos 3,891,374.11 for the year. Net profit after taxes was Pesos 1,835,831.72. The mine is being operated by *Benguet Consolidated Mining Company* on a 50-50 basis. Its share for the year was Pesos 1,313,640.26.

QUEENSLAND—Five thousand tons of pyrite from the huge iron pyrite deposits at Mount Morgan, formerly regarded as useless, have been shipped to Newcastle, New South Wales, where it will be converted into sulphur for fertilizer. Experts consider that Mount Morgan has a reserve of at least 10,000,000 tons of pyrite, enough to meet demands for the next 25 years.

FIJI ISLANDS—Housing and public utilities suffered considerable damage in a hurricane which passed over the *Emperor* and *Loloma* gold mines at Vatu-koula early this year. Mining installations and buildings escaped serious damage. Figures for the first three months show that *Emperor* treated 33,499 tons to recover 10,575 ounces of gold, while *Loloma* produced 3,485 tons in the same period to recover 3,171 ounces of gold. *Emperor Gold Mining Company, Ltd.*, *Loloma (Fiji) Gold Mines, N.L.*, and *Dolphin Mines Limited* operate at Vatu-koula as the *Associated Mining Companies*.

INTERNATIONAL

PHILIPPINE ISLANDS—Tonnage mined and treated during 1951 by *Mindanao Mother Lode Mines, Inc.* reached an all-time annual high of 119,800 tons. Gold content of the ore treated dropped to 0.47 ounce per ton, lower than any previous postwar year. Production output at official prices was Pesos 3,939,772.21. A small sand classifier was added to the washing plant and a primary ball mill-classifier was installed. These improvements increased mill capacity to 400 tons daily. L. E. Smith, general manager of the mine which is located in Surigao, Mindanao, believes that greater tonnage should be treated this year in order to maintain the 1951 production rate from available ore reserves.

WESTERN AUSTRALIA—First premium sales of gold have been made by the *Gold Producers Association* at an undisclosed price. If the current free market price is realized, the premium would represent an average of about 7/6d (\$1.05) per ton of ore treated in West Australia.

NEW GUINEA—*Eldorado Consolidated (New Guinea) Options Company, N.L.* is a new company, formed to test sluicing properties at Edie Creek.

VICTORIA—*Ajax Consolidated N.L.* expects to recover development costs by treating development ore at the State battery at Granya. Up to 100 tons per week will be treated at Granya until full-scale production is reached at the company's own plant. This firm is operating the *Womobi* tungsten lease which was partly developed by the Commonwealth Mineral Resources Bureau during the war. Ore reserves are estimated at 3,600 tons valued at £81,000.

TASMANIA—*Mount Lyell Mining Company, Ltd.*, Australia's big copper producer, anticipates higher production this year because of improved coke supplies. Because of coke shortages last year, 1,000 more tons of copper (in concentrate) were awaiting smelting than in the previous year. It is estimated that there were 20,398 tons of concentrate, contain-4,800 tons of recoverable copper, on hand awaiting treatment. Value of this copper at the current price was almost £A1,300,000.

VICTORIA—Extra steel for the Eildon Dam in Victoria has been obtained from Japan, according to C. L. Mayhew who is superintendent of construction for the United States contractors for the dam. Shipments of steel are on their way.

AUSTRALIA—High prices for tin, wolframite, and scheelite have caused a revival in prospecting in the Northern Territory of Australia and in Queensland. It is reported that at Chillagoe on Cape York Peninsula, even women and children are helping to dig wolframite ore. Concentrates of scheelite and wolframite are worth about 1,900 Australian pounds a ton.

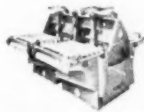
start construction in early summer and reach the production stage by next year. Quebec government officials report that plans have been made for the mining of pyrite from which sulphur will be produced by a special process.

ALASKA—Two new strikes have been made by the *Red Mountain Mining Company* on its platinum property in the Good News Bay area. A drilling program is planned for this year, as well as work on the other 29 claims owned by the company. The property adjoins that of *Good News Bay Mining Company*.

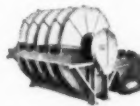
WISCONSIN—A zinc concentrating mill to treat ores from his *Edmond* mine in Iowa County, Wisconsin, is being built

by Vernon C. Davis of Linden, Wisconsin. The mill will cost \$140,000, while another \$50,000 will be spent for a mine plant and to open up the ore body which is located on 431 acres of leased ground. The Defense Materials Procurement Agency has agreed to underwrite the purchase of up to 3,000 tons of slab zinc from the new plant at 15¢ per pound if Mr. Davis cannot sell it to any other consumers.

ONTARIO—The length of the G ore-body of *Steep Rock Mines Limited* has been increased 50 percent by drilling to 4,500 feet, with an indicated width of 150 feet. Exploration is still to be completed. There is a possibility that the *Hogarth*



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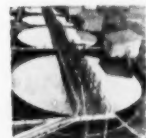
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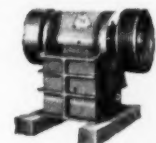
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NORTH AMERICA

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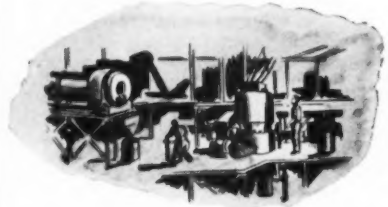
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and Errington mines and the intervening G zone actually comprise one continuous orebody.

LABRADOR—The largest civilian air lift in the world is being used to hasten development of the Labrador iron ore, according to W. H. Durrell, general manager of the *Iron Ore Company of Canada*. Supplies and passengers are being flown from Mont Joli on the south shore of the St. Lawrence River, and from Seven Islands on the north shore, to the 11 airstrips in use along the route where the 360-mile railway is being built from Seven Islands, Quebec, to Knob Lake on the Quebec-Labrador border. Airlift activities are expected to be heavier during the summer. Last season, 33,000,000 pounds of supplies and 22,246 passengers were flown in to the area.

QUEBEC—*East Malartic Mines* has completed its third and most westerly exploratory drill hole at the 16th (2,450-foot) level. Results have satisfactorily indicated an ore body 500 feet long with an average width of 120 feet, open at both ends. This represents an indicated tonnage of 5,000 tons per vertical foot, with an average grade indicated of over \$7.00 a ton. Instructions have already been given to deepen the shaft three levels and to open the 15th above. The present program involves the extension of drifts east and west from the cross-cut at a location well south of the ore body to facilitate shrinkage stopping. Drilling through the ore body will be done at 50-foot intervals.

ONTARIO—Two deeper diamond drill holes have been completed by *Headvee Mines* at its base-metal property in the South Onaman River area. It appears possible that ore measure may come up

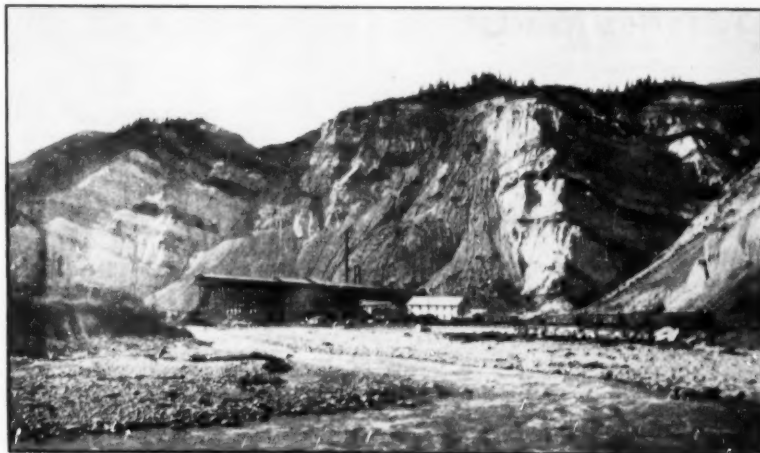
to 1,400 tons to the vertical foot or more. A third drill is to be added to the present two in operation. One drill will test a section in which cobalt and zinc values were secured while the two others will continue outlining the ore zone depth. *New Goldvee Mines and Cobalt Products* are providing funds for the present work.

MONTANA—The *Mouat* chrome mine in Stillwater County is to be put back into production by the *American Chrome Company* with a \$2,825,000 assist from the Defense Materials Procurement Agency. Operating capital of \$1,000,000 will be furnished by *Goldfield Consolidated Mines Company* of Reno, Nevada, parent company of *American Chrome*.

ALASKA—The *United States Smelting, Refining and Mining Company* will operate five dredges in the Fairbanks area and four in the Nome area, this season, according to James Crawford, manager of the *Fairbanks Exploration Company*. 500 men will be employed when the season is in full swing this summer.

QUEBEC—*Grandines Mines* of Roy, Quebec, report that three new drill holes, Nos. 23, 24, and 25, have further extended the indicated ore body and have returned good values of copper and gold. Molybdenite was present in all three holes and it is thought that there may be sufficient to be sold commercially. Core is being sent out for test. New leads for drilling have been provided by a recently completed Magnetometer survey.

ALASKA—John Ogriz and his partners, Eugene Uotila, Gus Uotila, and Elmer Keturi, have completed their mining operations on the South Fork of the Koyukuk and have moved their equipment to Stevens Village on the Yukon River where it will either be sold or rented. The 17 loads of equipment were moved 120 miles across country on nine go-devils, six sleds, one machine on skids, and one wanigan. Five tractors pulled them. They plan to mine on Teller Creek off the Kuskokwim, this year.



ALASKA'S COAL PRODUCTION BOOMS

Alaska's coal production reached an all-time high of 475,000 tons during 1951, and demands for 1953 have been estimated at nearly 1,000,000 tons. This will necessitate expansion of existing mines like Healy River above, or the entrance of new operators into the coal fields, or both.

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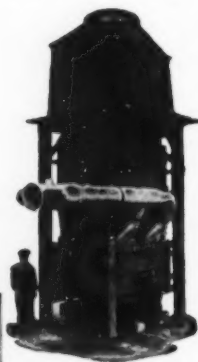
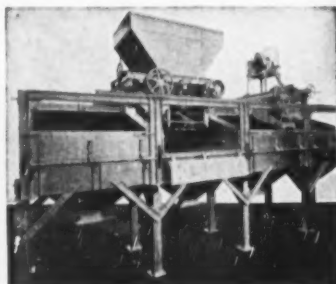
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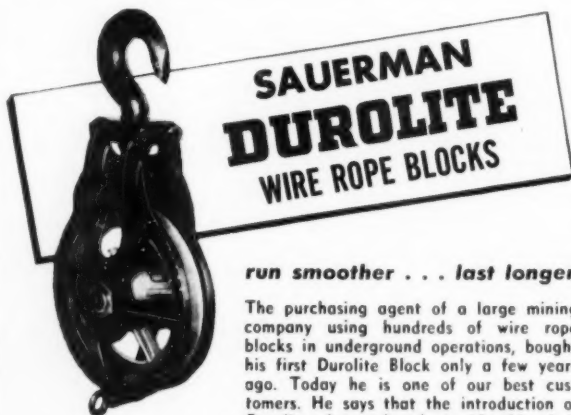


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INTERNATIONAL

exploration has revealed nickel, cobalt, and copper deposits which may be more important. W. S. Pekovich has owned the mine since 1915.

ONTARIO—*Noranda Mines, Ltd.* is planning to proceed with the building of an initial plant this year for the production of sulphur-dioxide gas, elemental sulphur, and iron oxide from Noranda pyrite. Noranda's chief accomplishment last year was in the finding of a large additional block of ore in the *Gaspe Copper Mines* property which it controls. The ore found totalled 8,025,000 tons. Added to the 57,000,000 tons reported previously, this makes a total of 65,000,000 tons of ore in reserve.

ALASKA—The 50th anniversary of the discovery of gold in the Fairbanks district of Alaska will be celebrated on July 22. A permanent monument will be erected on Pedro Creek in honor of Felix Pedro, the gold discoverer. It is also hoped that the new School of Mines building at the University of Alaska can be dedicated at that time. The school is scheduled to open this fall.

YUKON TERRITORY—The first 900 feet of the roadway from *Yukore Mines* campsite to the main adit of the *Idaho Hill* property has been completed by the Department of Highways. The 14-mile roadway from the campsite to the Carcross Highway has also been cleared and work has already commenced at the tunnel entrance. President Mike Mitto, further reported.

NEW YORK—Engineers in the New York operations office of the *United States Atomic Energy Commission* have developed a new device to replace the Geiger counter in searching for uranium. The new instrument can detect radio-active ores by counting the invisible gamma rays given off by uranium and radium faster and more precisely than the Geiger counter.

ALASKA—The *United States Tin Corporation* is working around the clock to develop the only lode tin deposit in Alaska. Installation of a 100-ton pilot mill has been completed at Lost River, producing two tons of tin and tungsten concentrates a day. The concentrates will be shipped to a separation plant being built at Seattle. Paul Sorenson, formerly manager of the *Hirst Chicago* gold mine in southeastern Alaska, is superintendent of the U.S. Tin mine.

BRITISH COLUMBIA—*Silver Ridge Mining Company* reports that to date it has blocked out about \$1,000,000 worth of ore at its *Wonderful* mine. Development work has shown the structure to be a typical Slocan ore body about 450 to 500 feet high. Ore was first encountered on the No. 2 level where it shows for a length of 450 feet, varying from four inches to five feet in width. A raise above this level has been in ore continuously for 90 feet, says John R. Kenney, managing director. The No. 3 level is 150 feet vertically below the No. 2 level and the No. 4 level 100 feet below the No. 3 has just been started.

QUEBEC—*Beccourt Gold Mines*' new mill which was purchased from *Perron Gold Mines* has been redesigned and modernized. Initial capacity is 500 tons a day, and equipment has been provided to enable larger tonnage increases at a minimum expense.

ONTARIO—Latest reports from the *Cobalt Lode Silver Mines* indicate that there is silver ore in the diabase on the 500-foot level. Thirty-five feet of mill grade ore has been revealed by the drift on the ore shoot. North on the same level, three raises have encountered good ore just above the 500-foot horizon. Over 100 feet of ore length is now indicated for a sub-level established at 475 feet. Mine manager Mario de Bastiani reports that the management will place a second shaft, the Calumet, in use later this year to permit expanded mining operations.

WASHINGTON, D.C.—The U.S. Department of Defense is conserving huge quantities of copper, zinc, nickel, and other strategic metals by substituting steel in the production of armaments. The saving in copper alone for the final quarter of 1951, amounted to 3,675,587 pounds. It is expected to total 5,000,000 pounds of copper in the first quarter of 1952. During the second and third quarters, the program is expected to produce the following savings: copper, 10,642,092 pounds; zinc, 598,401 pounds; and nickel, 601,973 pounds.



LATIN AMERICA

BOLIVIA—The contract between the *Compania Minera de Oruro* (controlled by the Mauricio Hochschild S.A.M.I.)

and the *Banco Minero de Bolivia*, by which the latter works the *San Jose* mine in Oruro on a royalty basis, has been extended for two years. The contract was made about five years ago when the production from this mine was as low as 40 tons of fine tin per month. Production now varies between 200 and 250 tons of fine tin per month, plus considerable quantities of lead, silver, and a small amount of copper.

VENEZUELA—Asbestos occurrences have been reported on a 2,500 hectare tract in Estado Bolivar, Venezuela. A shaft is now being sunk to a proposed depth of 200 feet and surface exploration is continuing. The project employs two miners and 25 laborers under the direction of Z. B. Kniazolucki.

CUBA—The *National Lead Company* has acquired a major interest in the *Nickel Processing Corporation*, operator of a United States government-owned nickel plant at Nicaro, Cuba. The plant was closed down after World War II. Regular production of 20,000,000 pounds a year is expected to begin this month.

MEXICO—Jose Zavala Galvan, a prominent Guanajuato businessman, is the new manager of the cooperative of 600 miners which has been working the *El Monte de San Nicolas* gold-silver mines at Guanajuato. He intends to put the enterprise on a business basis with profit for all, and to wipe out a considerable cash debt. He also plans to restore the miners to a regular weekly payroll. This cooperative has been in financial difficulty for some time.



PERSONNEL OF NICARAGUAN GOLD MINE

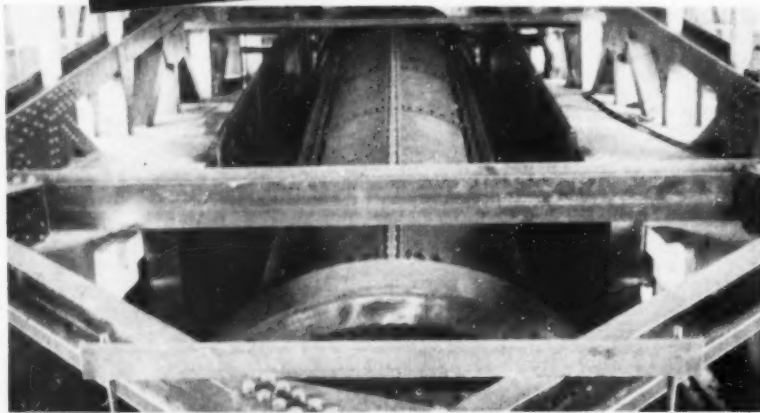
La Luz Mines, Ltd. at Siunda, Nicaragua, Central America's largest mine, is currently milling between 1,900 and 2,000 tons per day of gold ore. Grouped in front of the shaft above is a part of La Luz' staff. In the front row, left to right, are G. E. Fassler, chief engineer; Tony Besich, mine shift boss; Ed Cormier, engineer; Carl Walchuck, mine shift boss; T. N. Slaughter, manager; Gerry Feather, Diesel plant foreman; Mike Panasiuk, assistant electrical superintendent; Joa Webber, assayer; and Don Graves, mine shift boss. In the second row are H. S. McGowan, general manager; John Plecash, assistant mine superintendent; Norman Kentish, mine foreman; Arnold Tempest, open pit foreman; Gerry McDonald, garage and shovel foreman; Earl Haydon, machine shop foreman; Gus Hjalmarson, mine shift boss; Barry Edwards, assistant mill superintendent; and Bosco Milton, shaft sinking foreman. In the third row are John Guttridge, electrical superintendent; O. N. Spiers, mill superintendent; C. L. Spencer, mine superintendent; Pat Raleigh, engineer; George MacKay, master mechanic; and Ed Tokarek, mine shift boss.

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BOLIVIA—The leading exporters of metals and minerals from Bolivia during February 1952 are listed below in order of importance. The figures were released just before the recent revolution and the new government has given no indication of the availability of future production figures. The effect of the threat of nationalization of the minerals industry on production will not be known for several months but the information below may serve as a basis for comparison. Tin: *Patino Mines and Enterprises Consolidated, Cia. Minera Unifco Cerro Potori, Banco Minero de Bolivia, Bolivian Tin and Tungsten Corporation, Aramayo de Mines en Bolivia*; lead: *Banco Minero de Bolivia, Aramayo de Mines en Bolivia, Cia. Hunachaca de Bolivia, Empresa Minera Matilde, Empresa Minera Suarez Hos.*; zinc: *Cia. Huanchaca de Bolivia, Cia. Minera de Oruro, Banco Minero de Polivia, Aramayo de Mines en Bolivia, Bolivian Tin and Tungsten Corporation*; antimony: *Banco Minero de Bolivia, Empresa Minera Junkers, Empresa Minera Churquini, Cia. Minera Unifcado R. Cruz, Empresa Minera San Luis*; copper: *American Smelting and Refining Company, Cia. Hunachaca de Bolivia, Cia. Minera Unifcado del Cerro de Potosi, Banco Minero de Bolivia*; tungsten: *International Mining Company, Banco Minero de Bolivia, Cia. Minera Unifcado Cerro de Potosi*; silver: *Cia. Aramayo de Mining, Cia. Hunachaca de Bolivia, Banco Minero de Bolivia, Bolivian Tin and Tungsten Corporation, Cia. Minera Unifcado Cerro de Potosi*; gold: *Cia. Hunachaca de Bolivia, Banco Minera de Bolivia*. Total exports were: tin, 1,641 short tons; lead, 1,915 short tons; zinc, 1,840 short tons; antimony, 584 short tons; copper, 141 short tons; silver, 10,489 fine kilograms; gold, 1,078 fine grams.

VENEZUELA—It is reported that the Minister of Mines and Hydrocarbons is negotiating the establishment of a steel plant in Venezuela which will use iron and other raw materials produced within the country.

BRITISH HONDURAS—A geological survey in British Honduras has found that alluvial cassiterite is fairly generally distributed throughout North Stamm Creek and that traces also occur in tributaries of Sibun River and Freshwater Creek. Another examination is being made to determine whether large-scale prospecting is merited.

MEXICO—An official decree recently has placed gold under official control. All producers, buyers, sellers, and other traders in minerals or metallurgical products containing gold, must take a monthly report to the federal tax department regarding the fine gold they produce, manage, or consume.

CUBA—With completion of a power plant which the Cuban government is constructing, the *Isle of Pines Mining Company* expects to resume mining operations at its property which had been shutdown since September 1950 because of poor power facilities. The 250-ton mill is to be leased to *Transcontinental Resources* for use in its tungsten operations nearby. Revenue from the mill will be used to bring the gold operation of *Isle of Pines* into production again. Later slight alterations and additions may be made in the mill so that gold and tungsten operations can be conducted in conjunction with each other. *Isle of Pines'* most important ore shoot is on the 200 level where 850 feet of continuous ore was developed. The 1950

MINING WORLD

INTERNATIONAL

work increased the ore length on the 325-foot level to 800 feet. Raises showed ore continuity between the two levels.

MEXICO—Alarmed that silver production dropped 40 percent from 1940 to 1950, the *Banco Nacional de Mexico*, the Republic's largest private bank, asserts the reorganization of mining methods and procedures on the part of industry and the government is imperative to enable mining to continue as Mexico's No. 1 business. Mining, too, must be able to provide Mexican industry with metal and mineral products that are now imported at great cost, mostly from the United States. The Bank urges increased exploration to provide reserves, particularly, of the most vital metals and minerals.

PERU—*Industria Minera* has filed claims for two mineral deposits in Peru. The claims cover square kilometers and were filed for uranium, columbite, and tantalite. Jack Albert of Lima filed the claims for the company.

BOLIVIA—Serious consideration is being given to the development of the vast and rich iron deposits near the Brazilian border. Ores or pig iron could be easily transported via a small canal to be dug, to the Rio Paraguay, and on to the Atlantic Ocean at Buenos Aires. There seems to be a great similarity with the deposits of Urucum in Brazil. There, rich layers of intersected manganese ore have been found. Plans are being made for an extensive drilling program to see whether manganese is present in the lower strata of the Bolivian deposits. The *Banco Minero* holds large concessions in the area.

NICARAGUA—The *Compania Minera del Jabali* reports that no ore discoveries were made last year. 45,000 feet of drifting was completed on the 300 and 500-foot levels of the Estrella vein and ore reserves expected to last several years were developed. The company milled 56,100 tons during 1951, compared with 65,863 tons in 1950.

MEXICO—The *Cia. Minera Fernandez, S.A.*, working a manganese deposit near Talamantes, Chihuahua, is having water trouble. Farmers of the region have protested to the Hydraulic Resources Ministry against allowing the mining company to use water from the Talamantes Brook in its operations. They contend that the manganese contaminates these waters which they also use. The farmers want the mining company to get its water from wells which they say the company should drill.

CUBA—It is reported from Matanzas that gold-bearing deposits were discovered there in the course of excavations in search of sulphur. United States technicians investigating this find say that the deposits may be very rich.



SOUTH AFRICA—Work has started on a new £10,000,000 power station at Wilge, near Witbank, to augment the supply of power for uranium production. Original plans were to build a smaller

JUNE, 1952

station but the new one will have a capacity of 180,000 kw. Uranium production as a byproduct of the Rand gold mines is now expected to be three times greater than that first estimated in the original agreement between the United States and Great Britain in 1950. Twelve mines are now involved and first output is expected this month.

BELGIAN CONGO—The stockholders of *Geonines (Cie. Geologique et Miniere des Ingenieurs et des Industriels Belges)* have voted to increase their capital from 200,000,000 to 700,000,000 francs in order to work the new cassiterite-tantalum-niobium reserve recently discovered by borings under the cassiterite-tantalum-niobium quarry presently being worked at Manone-Kitotolo, Katanga, in the Belgian Congo. Estimated at several hundred thousand tons, the reserves are reported to be the largest presently known in the world, according to Geonines' managing director. The company has also decided to bring in 15,000/35,000 hp. from its

Piana-Mwanga hydroelectric station on the Luvua, a tributary of the Lualaba (Upper Congo). Geonines has already built a series of crushing plants and a big concentrator which were put into commission a few months ago.

ORANGE FREE STATE—The *Brand Mining Company* has obtained one of the richest gold cores ever recovered in the Orange Free State. Surface borehole No. W8 on the farm Welkom No. 80 was sunk 6,100 feet north of No. 1 shaft, cutting Basal Reef 3,981 feet below the surface. The average value was 5.580 ounces of gold per ton over a 2.5-foot width. The average for gold ore milled on the entire Rand last year was 0.187 ounces per ton.

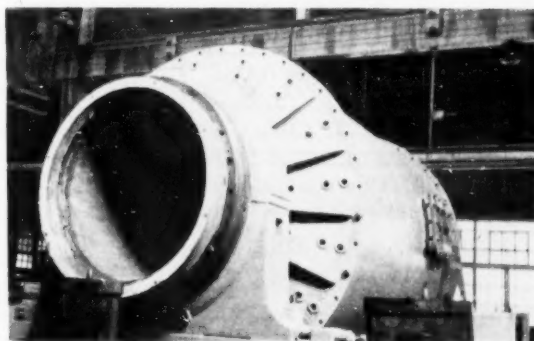
TANGANYIKA—Important deposits of good quality coal have been proved by diamond drilling by geologists of the *Colonial Development Corporation* in the southern province in the Songeo district.

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1 of the 6-10' dia Marcy Mills being manufactured for a large iron producer in Minnesota. This taconite pilot plant will use 3-10' x 14' Marcy Special Grate Discharge Ball Mills and 3-10' x 12' Marcy Open End Rod Mills.

Other MASSCO products: Masco-Fahrenwald Flotation Machines, Genuine Wilfley Tables, Masco-McCarthy Hot Millers, Rock Bit Grinders, Density Controllers, Belt Feeders, Rubber Pinch Valves, Assay and Laboratory Supplies and Equipment, Complete Milling Plants.

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[World Mining Section—57]

INTERNATIONAL

The question of development is now being considered by the government, in conjunction with the corporation. Their decision will depend upon whether there are adequate markets and whether transportation facilities can be made available.

SOUTH AFRICA—The government has purchased the mineral rights to phosphate deposits at Palabora near Tzaneen at a cost of £721,000, and their development is expected to make South Africa independent of imported phosphates. Recovery of phosphate concentrates at the rate of 200,000 tons per year is planned, at a capital expenditure of about £1,500,000.

LIBERIA—Republic Steel Corporation in the United States is importing iron ore from Liberia for high-grade electric furnace steel. Last year Republic brought in 167,000 tons and this year it is hopeful of importing 1,000,000 tons. One carload of 50 tons was sent to Chicago last year; this year that same plant hopes to receive 40,000 tons. The small shipment was used for experimental purposes in the production of electric furnace special alloy steel for gun barrels. The ore was reported "to have worked fine." The Liberian deposit, owned by the *Liberian Mining Company*, is estimated to contain 25,000,000 tons.

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TANGANYIKA—The erection of a pilot plant by *New Consolidated Goldfields Ltd.* at the extensive kaolin deposits near Pugu has been completed. At the *Williamson* diamond mine a new power station, housing two 900-KVA units, and foundations for a third, have also been completed. At the *Geita* gold mine, there was an increase in tonnage treated and gold produced last year, while at the *Mpanda* mine, the pilot plant continued to operate satisfactorily and 2,965 tons of lead concentrates were exported. Underground development work is continuing at this operation.

UGANDA—The phosphate and iron deposits at Tororo in the Mount Elgon area continue to attract attention. These extensive deposits are located about 100 miles from the site of the dam at Owen Falls on the Nile River from which the Uganda Electricity Board expects to produce electricity by June 1953. Six 15,000-KW generating sets are on order, and there is provision for a total of ten sets ultimately on this site; other power sites are available along the next 50 miles of the river. At Tororo, a new cement plant is going into production and the possibilities of a large plant for phosphate production are now being examined by a United States chemical firm. A British firm is also interested in other phosphate deposits in the same area.

SOUTH AFRICA—Borehole BU4, drilled by *Middle Witwatersrand, Ltd.* on

behalf of itself and *New Pioneer Gold Mine*, has been completed. It is located on the farm Buffelsfontein 75, about 9,500 feet north-north-east of hole BU5. In the original drilling and in the first deflection, the Vaal Reef was found to be faulted out. In the second deflection, the Vaal Reef was intersected at 8,186 feet and assayed 13.54 dwt. over 14.5 inches or 196 inch-dwt. A third and final deflection cut the reef at 8,185 feet with values of 15.47 dwt. over 14.6 inches, or 226 inch-dwts., and complete core recovery. In addition to the above companies, *Anglo-Transvaal Consolidated Investment Company*, *Strathmore Consolidated Investments, Ltd.*, *Eastern Rand Extension, Ltd.*, *Southern Van Ryn Reef Gold Mining Company, Ltd.*, and *Alpha Free State Holdings, Ltd.* are interested concerns.

GOLD COAST—On No. 10 level stope drive at the *Boabedroo* mine, three reef channels have been disclosed, known as main, subsidiary, and spur reefs, respectively. *Konongo Gold Mines Limited* of Ashanti in the Akim district owns the mine. The spur reef is off the main channel and about 110 feet long. To the north of the drive, the main and subsidiary reefs meet in a highly disturbed area. To the south, the reef has narrowed considerably but it is well-defined and graphitic schist and gouge are increasing; the reef is also extremely shattered and carbonated similar to conditions on No. 9 drive, southwest, at about 60 feet from the end

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of the shoot. When the area has been fully developed, the final average width and value of the reef will be computed. In the meantime, it is estimated there are 258 feet of reef, averaging 19.9 dwt. per ton over 176 inches.

SOUTH AFRICA—The underground connection between No. 1 and No. 2 shafts in the western section of *West Driefontein Gold Mining Company's* property has been accomplished and development operations will be accelerated or at least facilitated.

GOLD COAST—*Ariston Gold Mines (1929) Ltd.* last year milled 328,370 tons of ore of an average grade of 7.134 dwts., compared with 293,000 tons of 7.564 dwts. graded in 1950. In addition, 5,402 tons of accumulated concentrates were retreated and 808 ounces of gold produced from special treatment of slags.

On recommendation of the general manager and technical advisers, after assessment of the ore reserves position in conjunction with available supplies of labor and materials, it was decided to limit expenditures on development work to exploration of the North ore body. Development here on the 24th level has proved its downward extension with the resulting indication of considerably more payable ore. This development is of major importance. The tonnage sent to the mill from the mine is within the present 30,000-ton-a-month capacity of the plant. A final milling unit is now being shipped to the location to bring the total milling capacity up to 40,000 tons a month. Delivery of a hoist necessary for this higher milling rate is expected in about a year.



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JUNE, 1952

U.S. METAL & MINERAL MARKETS

METALS

May 16, 1952

COPPER:	Electrolytic. Delivered F.o.b. cars, destination U.S.A.	24.50¢
	Lake. Delivered, destinations U.S.A.	24.625¢
	Foreign Copper. New York	27.50¢
	Common Grade. New York	15.00¢
LEAD:	Prime Western. East St. Louis	19.50¢
ZINC:	Primary 30 pound ingots (99% plus). F.o.b. shipping points	19.00¢
ALUMINUM:	Bradley Mining Co.'s Elk Brand 99.5%. F.o.b. Cascade, Idaho	44.50¢
ANTIMONY:	Lone Star Brand. F.o.b. Laredo, in bulk	44.00¢
	(In ton lots) price per pound	\$2.25
BISMUTH:	Sticks and bars. 1 to 5 ton lots (Price per pound)	\$2.55
CADMIUM:	97-99%, keg of 550 pounds (Price per pound)	\$2.40
COBALT:	Ingots (99.8%). F.o.b. Freeport, Texas	24.50¢
MAGNESIUM:	Flasks. Large lots, New York	\$201.00-\$204.00
MERCURY:	"F" Ingots (5 pounds). F.o.b. refinery, Port Colborne, Ontario	56.50¢
NICKEL:	Grade A Brands. New York (Price per pound)	121.50¢
TIN:	(98.5%). F.o.b. Beverly, Massachusetts	\$7.00
TITANIUM:	United States Treasury price	\$35.00 per ounce
GOLD:	Newly mined domestic. United States Treasury price	90 1/2¢ per ounce
SILVER:	Foreign. Handy & Harman	87.00¢ per ounce
	\$102.00 to \$105.00 per ounce
PLATINUM:	(\$105.00 price goes to \$93.00 after July 27th.)

ORES AND CONCENTRATES

BERYLLIUM ORE:	10 to 12% BeO. F.o.b. mine, Colorado	\$36.00 per unit
CHROME ORE:	F.o.b. railroad cars eastern seaports. Long tons dry weight.	
	African (Rhodesian). 48% Cr ₂ O ₃	\$43.00-\$44.00
	African (Transvaal). 48% Cr ₂ O ₃	\$34.00-\$35.00
	Turkish. 48% Cr ₂ O ₃ . 3 to 1 chrome-iron ratio	\$53.00-\$54.00
	U. S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, \$115.00; fines and concentrates \$110.00 for 48% Cr ₂ O ₃ and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr ₂ O ₃ .	
IRON ORE:	Lake Superior. Per gross ton Lower Lake Ports.	
	Mesabi, Non Bessemer, 51.5% Fe	\$ 8.30
	Mesabi, Bessemer, 51.5% Fe	\$ 8.45
	Old Range, Non Bessemer	\$ 8.55
	Old Range, Bessemer	\$ 8.70
MANGANESE ORE:	Metallurgical grade. 46 to 48% Mn. Long ton unit \$115.00-\$123.00	
	Chemical grade. 80% MnO ₂ . Per ton	\$60.00
	Chemical grade, domestic, 70% MnO ₂ , F.o.b. mines	\$45.00
	U. S. Government ore purchase depot Deming, New Mexico. Base price, \$6.10 per long dry ton for 15% ore. Price increasing to \$76.00 for 40% ore. Less \$12.00 per long dry ton for milling. U. S. Government purchase depot Butte, Montana. Base price, \$6.05 per long dry ton for 12% ore. Increasing to \$40.42 for 30% ore. U. S. Government purchase depot Phillipsburg, Montana. Base price, \$6.43 per long dry ton for 15% ore. Increasing to \$34.81 for 30% ore. (Montana ore must contain not less than 90% as carbonate).	
MOLYBDENUM CONCENTRATE:	90% MoS ₂ . F.o.b. Climax, Colorado. Per pound of contained molybdenum, plus cost of containers	\$1.00
TUNGSTEN CONCENTRATE:	60% WO ₃ . Per short ton unit	\$65.00
URANIUM ORE:	Carnotite-Roscoelite. F.o.b. purchase depot plus \$0.06 per ton mile (\$6.00 maximum), Grand Junction, Rifle, Durango, Naturita, and Uravan, Colorado. Salt Lake City, Marysville, Thompsons, and Monticello, Utah. Shiprock, New Mexico. Base price for 0.10% ore is \$1.50 per pound and up to \$3.50 per pound of contained U ₃ O ₈ plus \$0.75 per pound for each pound in excess of 4 pounds per short dry ton and an extra allowance of \$0.25 per pound for each in excess of 10 pounds. A \$0.50 per pound development allowance paid on all ores purchases. At shiprock all ores with more than 6% lime are penalized for excess lime content.	
VANADIUM ORE:	Carnotite-Roscoelite. V ₂ O ₅ in ratio of more than 10 parts to 1 part of U ₃ O ₈ are generally acceptable at all AEC depots, but excess not paid for at Marysville, Monticello and Shiprock.	

NON-METALLIC MINERALS

BENTONITE:	Minus-200-mesh. F.o.b. Wyoming points. Per ton in carload lots	\$12.50
	Oil Well grade. Packed in 100 pound paper bags	\$14.00
FLUORSPAR:	Metallurgical grade. 70% effective CaF ₂ content per short ton F.o.b. Illinois-Kentucky mines	\$42.00-\$43.00
	Acid grade. 97% CaF ₂	\$60.00
PERLITE:	Crude: F.o.b. mine per short ton	\$3.00 to \$5.00
	Plaster grades. Crushed and sized. F.o.b. plants per short ton	\$7.00 to \$9.00
	Concrete grades. Crushed and sized	\$6.00 to \$8.00
SULPHUR:	Long ton, F.o.b. Gulf Coast mines	\$22.00

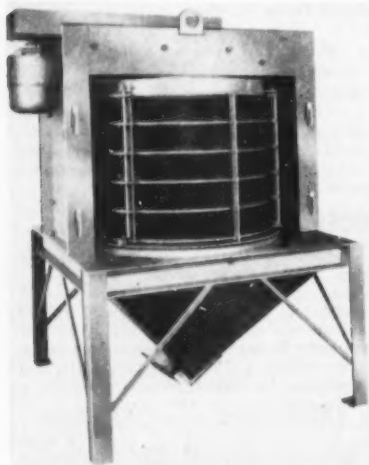
Quotations on metals and certain ores through the courtesy of *American Metal Market*, New York, N.Y.

PRODUCTION PEP EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill, or smelter. This PEP section is MINING WORLD'S way of making available to you some of the finest current information on mechanization.

New Symons "V-SCREEN"

Nordberg Mfg. Co. announced late in April a new vertical type screen providing high capacity in the separation of



wet or dry materials from 4-mesh to very fine sizes. The machine has been thoroughly tested and is now available to the industry. It combines a centrifugal action equal to five times the force of gravity with a gyratory movement. In addition to greater capacity the new screen also provides utilization of product formerly difficult to screen. Vertical design makes it particularly advantageous for use under vertical chutes. For further information circle No. 34 on PEP card.

Versatile New Bin-Level Controls Are Automatic

Two additions to their line of "Tellevel automatic bin level control switches have been announced by Stephens-Adams Manufacturing Company in bulletin 11-0 recently released. In addition to the nor-



HIGH-LIFT STRIPPER SHOVEL

Recently introduced by the Koehring Co. is the new hi-lift stripping shovel shown above, units of which are now working in several parts of the country. Unit employs both 2 and 2½ cu. yd. dippers, depending on digging conditions. Using same base as the company's standard 2½ yd. Model 1005 machine, the hi-lift stripper operates with a 50' boom and 36' dipper stick, allowing a maximum dumping height of 40' and a reach of 60' with boom angle at 45 degrees. For further information circle 44.



mal-duty Tellevel, heavy-duty and explosion-proof units are now being manufactured to meet special installation conditions. All units are designed so that a rising, or falling level of material in bins deflects a pendant float actuating a control switch.

The heavy-duty model is recommended where materials, such as plus three-quarter-inch ore, are being discharged to bins. Complete installation directions are included in the new bulletin, as well as suggested wiring diagrams for direct control of conveyor units, or for actuation of warning lights, or other signals. For your copy of the bulletin, circle No. 75.

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MULTIPLE-SHOT BLASTING UNIT: Improved firing action, safety and dependability in a compact light-weight assembly (1 lb.) are features of a new multiple shot blasting unit announced by Mine Safety



Appliances. Unit will fire up to 10 shots simultaneously, can be carried on the belt by means of snap-on clip. Circle 65.

LONG-RANGE SCRAPER EXCAVATORS: New Sauerman Bulletin describes methods for fast haulage by a single operator of large yardages from any point within cable radii, including down into deep pits, up hills or across a wide stockpile. For complete catalog circle 55.

GLOBAL CONTRACT DRILLING SERVICE: New General Bulletin No. 83 by E. J. Longyear Co. of Minneapolis, Minn., describes complete services in shaft sinking, contract drilling, mine development and geological investigations, including their own manufactured line of diamond core drills and equipment. Circle 57.

REAGENT FEEDING: New bulletin issued by Clarkson Co. covers complete line of feeders for use with all liquids including corrosive reagents and assuring accurate measurements from two drops to two liters. Circle 59.

NEW SYMONS "V" SCREEN: Nordberg Mfg. Co. has announced a new high-capacity unit for sharp separation of wet or dry materials from 4-mesh to very fine sizes. Machine combines centrifugal action

with five times the force of gravity with a gyratory movement, providing greatly increased capacity and utilization of product heretofore difficult to screen. For complete data circle 60.

LOCO BATTERY TRANSFER RACK: New Bulletin by Mancha sets forth data on improved fast method of changing locomotive batteries, permitting haulage equipment to stay in continuous service. Circle 61.

PORTABLE GRINDER-CLASSIFIER: Complete packaged units for use in wet or dry grinding as a pilot plant or laboratory unit is subject of new brochure issued by Hardinge Co. Circle 62.

POWER OPERATED VALVE: Ledeen Mfg. Co. has announced the new POV Power Operated Valve, available in six sizes and suitable for air, oil and water operation with option of finger, cam, toe or solenoid pilot controls. The unit is designed for remote control and automatic operation. For further information, circle 63.

FORGED STEEL BITS: New catalog V-1708 by Drill Bit & Tool Co. of Midland Penna., describes three socket series and seven types of hollow steel drill rods not offered to the mining field. Circle 64.

WORLD-WIDE DIAMOND DRILLERS: The Consolidated Diamond Drill Corporation is prepared to complete contracts in any part of the world. Information on their complete facilities will be sent to all interested. Circle No. 39.

LIGHT-WEIGHT PIPE FOR MINING: A new bulletin has been released showing typical applications of Naylor Lockseam Spiralweld pipe in the mining, construction, oil and related industries. For a copy circle No. 41.

LATEST FLOTATION INDEX: 22nd Annual Edition of Dow Chemical Company's authoritative guide to published material on flotation is now being printed. Copies may be obtained by writing to Dow Chemical Co., 310 Sansome St., San Francisco, Calif., or by circling 46.

NEW MOTORIZED HEAD PULLEY: Representing a new departure from conventional types of conveyor drives, this new motorized pulley is a fabricated steel drum, normalized to relieve stresses, with

self-contained electric motor and reduction gears. The new Schrock unit will find application in mining, milling and crushing operations, where its compactness will reduce space requirements and its simplicity and mobility provides major time and labor economies. For detailed bulletin issued by Yuba Mfg. Co., circle 47.

IMPROVED JIG FOR MINING: New M-8 Yuba Jig offers stationary hutch valves, even pulsation over entire bed surface, reduced over-all height, trouble free frictionless drives and standardization of all component parts. Applicable to gold, tin, platinum, monazite, cobalt and a variety of other minerals. For complete bulletin, circle 48.

FACTS ABOUT SCREEN CLOTH: New 28-page file-size book tells exactly how to specify and order the correct size and type of screen cloth for every mining application. To obtain free copy of Hewitt-Robbins Bulletin 113-B, circle 49.

DRIFTER AND JUMBO BOOMS: Lower costs through better fragmentation, ease in spotting holes, and higher drilling speeds for faster cycles are some of the features offered by the Le Roi-Cleveland Jumbo Booms and power-feed drifters. For full information circle 50.

SMALL DIESEL ENGINES: Design and operation features of the one, two and recently introduced three cylinder Type 4FS diesel engines are illustrated and described in a new 12-page, two-color bulletin published by Nordberg Manufacturing Company. The units are built for continuous or standby service, and range from 10 to 45 hp within an operating speed range of 1200 to 1800 rpm. Circle No. 27.

ECONOMICAL SLUSHER OPERATION: New Gardner-Denver Bulletin AS-3 provides information on economies offered by their air slusher. Features include steady power, faster operation providing more trips per shift, elimination of air-waste idling between trips and single throttle control. To obtain bulletin circle 53.

TRACTOR WHEEL RIMS: Renewable manganese tractor wheel runs for drive sprockets and idler wheels of Caterpillar Track-type Tractors are the subject of a new brochure by Alloy Steel & Metals Co. Hubs may be saved by economical process of welding on a manganese Pacific rim. For complete information circle 69.

Circle numbers and mail this card for free product literature

To get further information on any item described in the Production Equipment Preview, note the key number of that item, circle the corresponding number on the PEP card at the right, and mail. If mailed from a point outside the United States, proper postage must be used.

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June '52

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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

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TRACTO-SHOVELS IN LARGER SIZES: Addition of 2 yd., 3 yd. and 4 yd. sizes in front-end shovels for tractors to the former 1 yd. size has multiplied scope of tractor usefulness in mining and construction operations. Details on 14 different attachments for tractors is available from Allis-Chalmers Mfg. Co. Circle 54.

ROUND-THE-CORNER SLUSHING: New Bulletin No. 215 offered by Alloy Steel and Metals describes equipment and method for slushing around corners and eliminating double cycles. Easily and quickly installed in timbered or hard rock operations. Circle 56.

HOSE ASSEMBLIES FOR MINING: A new catalog has been released by the Carlyle Rubber Co. Dept. G-1, 64 Park Place, New York City, setting forth specific data on industrial rubber hose assemblies for all types of mining equipment. Circle 58.

TRANSMISSIONS BOOKLET: Publication of a booklet containing condensed specifications on its entire line of heavy-duty transmissions and auxiliaries, is available from the Fuller Manufacturing Company. Quick reference data includes number of speeds, type of mounting, truck and industrial applications, specific gear ratios, approximate engine size, installations dimensions, weight, etc. Circle No. 36.

EXPLORATION SPECIALISTS: The highly trained specialists of the New World Exploration, Research and Development Corporation are available for both domestic and foreign work on scientific minerals exploration. For further details, circle No. 38.

FREE HAULAGE ANALYSIS: To give you the latest information on the most efficient underground haulage system available for the specific needs of your operation, engineers of the Mancha division of the Goodman Manufacturing Company have designed a data form on which they can base a complete analysis of the haulage problems inherent in any given operation. Readers of **WORLD MINING** outside the United States can obtain the data form without obligation or charge by clipping and sending to Mancha the coupon on page 64 of the overseas edition. United States readers interested in Mancha's haulage service should circle no. 23.

ELECTRIC CAR SPOTTER: Link-Belt's new capstan type car mover allows one man to exactly spot up to 6 loaded full-size railroad cars. For complete details circle No. 32.

ORE BLENDING INFORMATION: A new handbook on the subject of ore blending has been issued by Hewitt-Robins, Inc. This 16-page illustrated booklet supplies a thorough explanation of the advantages, principles, methods and evaluations of blending. To get this blending bulletin No. 152, circle No. 33.

BULLETIN ON MILL CONTROL: The latest bulletin, No. 851, on Merrick's Weightometers and Feedweights has been released by the company for distribution to those interested in better circuit control in mills and plants. Circle No. 37.

HI-CAPACITY BLASTER: Du Pont has announced an entirely new battery-condenser blasting machine that is capable of firing 1200 caps when connected in parallel-series. This portable blaster offers maximum safety at all times and contains no moving parts. Circle no. 1.

NEW OVERLOAD GUARD: To protect valuable machines and motors from the dangers of overloading, the Dodge Manufacturing Company has introduced a positive-action release that loosens drive belts, shuts off power, and gives a warning signal. The unit is simply installed and easily adjusted for the needs of each installation. Circle no. 2.

IMPROVED CARBIDE BITS: With channel design that gives maximum clearance and with full insert support to absorb impact on every stroke, Brunner and Lay Rok-Bits guarantee the most for your money from both man and machine. Circle no. 10.

pH CONTROL IN MILLING: New Data File describes latest techniques with completely electrometric equipment for instantly determining the exact pH of any flotation circuit. This literature shows how greater speed, convenience and accuracy can be obtained in laboratory leaching or flotation tests, with provision for centralized or automatic control of multiple flotation circuits. Applicable to the flotation of lead, zinc, copper, gold, tungsten and many other ores and minerals. Write for Data File 5-54 direct to Beckman Instruments, South Pasadena 54, California, or circle No. 40.

PERFORATED SIZING PLATE: The Hendrick Manufacturing Company's perforated plate catalog contains the details and specifications of their complete line of screen plates, available in flat or corrugated forms in any desired gauge, size, or hardness. Circle no. 67.

FILTERS FOR PROTECTION: Winslow Free-Flo filters for the protection of valuable motors from dirt, abrasives and other unwanted adulterants are available for oil, fuel, water and air circuits. Descriptive literature on the superior filters that have resulted from years of Winslow's experience, is available. Circle No. 2.

EXPLORATION WITH AERIAL SURVEY: For complete information on the international services and facilities that have made Aero Service Corporation one of the world's outstanding photogrammetric and magnetometer companies circle No. 3.

THE NEWEST IN MINE PIPE: Have you ever wanted mine pipe that won't rust, rot or corrode; a flexible pipe that can be used with hot or cold water, acids or alkalis under pressure or suction? Such pipe is now available from the Yardley Plastic Company in sizes from 1/2" to 6". Circle no. 16.

WET MAGNETIC SEPARATORS: Jeffrey drum-type separators are the subject material of a new bulletin No. 846. The easily-maintained, hi-capacity units are fully illustrated and completely described. Circle No. 25.

VERTICAL SANDPUMPS: A new vertical centrifugal sand pump by Telluride Iron Works handles coarse material at high efficiency with a minimum of parts. Circle No. 21.

DRILLS FOR EXPLORATION: The diamond and shot core drills manufactured by the Acker Drill Company, from the small jeep-mounted model to the large transportable units, are outlined in Acker bulletin No. 33. Circle No. 13.

MILL EQUIPMENT SALE: Through recent expansions, Denver Equipment Company requires more productive area. Space occupied by used equipment units is needed. For a copy of price lists that describes each unit for sale, circle No. 12.

For Free Product Literature,
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Four-Point Carbide-tipped Steel Offers Advantages

Following the acceptance of the chisel-type Intra-Set drill steel, in which steel and carbide bit are integral, the Rock Bit Sales & Service Co. now offers four-point Intra-Set steel. This is made in 1½" or 2¼" gauge sizes and in lengths up to 12 feet, with shanks to fit any hammer. As the alloy drill steel and



carbide bit are of one piece construction, there are no attachments to loose, bind or strip. The manufacturer claims, that in field operations, the four-point Intra-Set steel drills faster and further, gauge loss is less, sharpening required less frequently, longer life results and that a neat round hole is drilled for follow-up work. Descriptive bulletin available from Rock Bit Sales & Service Co., 2514 East Cumberland St., Philadelphia 25, Penna., or circle 43.

New Scoopmobile Proves Versatile Material Handler

Production of a new all-hydraulic, Scoopmobile, Model H, has been announced by the Mixermobile Manufacturers.

The new all-hydraulic Scoopmobile is



a culmination of 15 years of development of front-end loaders by the company's engineering department and has been christened the "one armed bandit" due to its single boom operation. Model H, equipped with ¾-yard scoop, has a rated lift capacity of 4000 pounds and a

standard discharge height of eight feet.

Vickers hydraulic steering, combined with Mixermobile planetary drive, provides the maneuverability and the power to make the Model H a versatile and efficient front-end loader.

Its many uses include loading, transporting and stockpiling as well as leveling and backfilling. For further information, circle No. 79.

Stitch in Time Saves Nine For Conveyor Belt Users

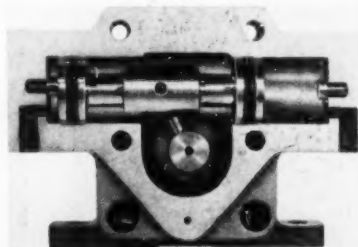
In order to get the maximum service life out of conveyor belting, industrial users should take particular care to repair all belt damage as soon as it is discovered.

Belt fabric exposed to weather will absorb moisture if the protective cover becomes damaged. In warm weather, this condition leads to mildew and rot; in winter, ice crystals may gnaw at the fabric from within as the belt flexes. Thus, immediate repairs not only prevent the spread of damage, with its threat of premature failure, but also keep out the water which is the natural enemy of any conveyor belt.

The simple tools and procedures for belt repairs have been outlined by Newell Perry, belting engineer of the Thermoid Company, to help the maintenance man to give belting proper attention. For a copy of this helpful paper, circle No. 74.

Remote Control Power Valve

Ledeen Mfg. Co. has announced the new POV Power Operated Valve, available in six sizes and suitable for operation by



air, oil or water with option of finger, cam, toe or solenoid pilot controls. Unit is designed to serve a variety of purposes where hand or foot operated valves cannot be used. For further information circle 45.

Mining Men Complete Detroit Diesel Training

In April Detroit Diesel Engine Division of General Motors completed a four month series of courses in Diesel engine operation and maintenance on the Mesabi Iron Range in northern Minnesota.

Over 250 equipment supervisors and mechanics representing 30 mining companies attended the one week courses which started January 7.

The school was given by one of General Motors nine mobile training units which are currently operating in distributor and on-the-job locations throughout the United States, Canada and Mexico.

Notes From The Manufacturers

W. A. SPITZER, has been named western division engine sales representative for Caterpillar Tractor Company, with headquarters in San Leandro, California. Appointed in the same capacity, with headquarters in Spokane, Washington, was



Glen F. Sankey. Both men will work with Caterpillar distributors throughout the west, assisting them in the application and installation of Caterpillar Diesel engines.

Theodore A. Webster has been appointed manager of General Electric Company's Duluth office. He succeeds C. R. Jacobus who has retired after having been manager in Duluth for almost 20 years.

Stockholders of Worthington Pump & Machinery Corporation recently voted to change the company's name to Worthington Corporation. H. C. Ramsey, president, stated that since Worthington is now engaged in manufacturing diversified products, the inclusion of "pump" in the company name tended to lead the public to the conclusion that pumps were their only product. Worthington's history goes back to 1840 when they manufactured the first single direct-acting steam pump. Today they manufacture such varied products as diesel and gas engines, air conditioning and refrigeration equipment, electric motors, generators, construction equipment and other machinery.

Baldwin-Lima-Hamilton Corporation, Lima-Hamilton Division has announced the appointment of James A. McCrae as sales and service engineer for Colorado and parts of Wyoming. Mr. McCrae will have his headquarters in Denver, Colorado.

Straub Manufacturing Company, Inc., of Oakland, California has selected Universal Equipment Company, 2015 West 44th Avenue, Vancouver B. C. as its exclusive representative for British Columbia, Alberta and the Yukon. Universal Equipment will distribute the Kue-Ken jaw crushers. Kue-Ken gyratory crushers, rib-cone ball mills and other crushing and mining machinery made by Straub.

The rapid expansion in recent years of Hewitt-Robins, Inc. has prompted the company to move its headquarters to Stamford, Connecticut from New York City. Hewitt-Robins, producer of belt conveyor systems, vibrating machinery, and industrial hose, will lease the former Crofoot property in the Glenbrook section of Stamford.

A. F. Matheis, one of the Nation's leading experts in the heavy industrial rubber field, has been appointed assistant sales manager of Industrial Products at Thermoid Company in Trenton, N. J. Mr. Matheis has been with Thermoid for 24 years and was formerly sales promotion manager.

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Some of the many other advantages to be gained from conveyorizing your operations with Hewitt-Robins Belt Conveyors are: "Packaged" installation . . . each conveyor is specially designed and constructed to match your particular requirements from a wide selection of standard component parts.

Most important of all . . . Hewitt-Robins, and *only* Hewitt-Robins is prepared to assume single, unified responsibility for successful operation.

Because, Hewitt-Robins is the *only* company that manufactures within its own corporate structure both the specialized machinery *and* the belt!

No other organization is better prepared to offer you the advantages of belt conveyorizing. For Hewitt-Robins, originator of the rubber-covered belt, troughing idler and many other basic developments, has a world-wide reputation as the leader in design, construction and installation of belt conveyor systems.

Learn how your operation can benefit from Hewitt-Robins Belt Conveyorizing. Write us the details of your bulk materials handling problems and we will show you how Hewitt-Robins Belt Conveyors provide the answer. We also can assist with your processing problems, for in addition to belt conveyors we manufacture vibrating screens, dewatering equipment and screen cloth.

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Marion Power Shovel Company has opened a new PARTS WAREHOUSE at Phoenix, Arizona in an important forward step to improve and strengthen service to owners of scores of Marion machines in Arizona and Utah, and portions of Nevada and New Mexico.

There are many types and sizes of Marion machines in different classes of work in this vast area, and the new warehouse will seek to serve the interests of all of the many owners. As time goes on, the warehouse will become progressively more

able to work closely with the owners in the field.

Regardless of the type or size MARION you own, look to the new Phoenix PARTS WAREHOUSE for service assistance and genuine MARION replacement parts . . . the parts that assure satisfactory performance and long, dependable service.

Marion's Phoenix warehouse has both rail and trucking facilities. It is located at 1017 North 22nd Avenue. The phone number is 2-5371.

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ASARCO Shipping Ore From Garbutt-Sunday

The American Smelting and Refining Company is shipping mill-grade, base-metal sulphide ore carrying gold, zinc, lead, and silver from its deep-level, Garbutt-Sunday orebody in the Leadville, Lake County district of Colorado. Regular shipments are being trucked to the custom mill unit of the Resurrection Mining Company at the portal of the Yak tunnel, also in the Leadville district. Development work is on the 625-foot-deep Irene No. 2 winze below the 1,000-foot level of the Eclipse shaft. John G. Mitchell is Leadville mine unit superintendent.



Eighty miles of access roads to uranium mines in Colorado and Utah are to be constructed under contract. Rebuilding and gravelling of 33.5 miles of existing mine roads in the Long Park-Monogram Mesa areas of Montrose and San Miguel Counties, Colorado, is estimated to cost \$211,258. Grading of 47.1 miles of mine roads in the Gateway, Calamity Mesa, and John Brown districts in Mesa and Montrose counties, Colorado, and Grand County, Utah, is estimated to cost \$90,257.

The York Investment Company is expanding operations at its leased Kimberly mine at Kokomo, Summit County, Colorado. Development work continued during the winter months and large shipments of ore are expected this summer.

Ore shipments have been resumed from the Queen of the West mine at Kokomo, Summit County, Colorado. The zinc-lead sulphide ore is trucked to a custom mill at Leadville, Colorado. Dell Litz is in charge of operations.

The new crushing plant of the Telluride Mines, Inc. at the portal of its mill level tunnel at Telluride, Colorado, is operating satisfactorily and handling about 125 tons per hour of mine-run ore. New equipment in the mill includes flotation machines, a pH control unit with Bristol recorders, new lime feeders, and reagent mixing tanks. Charles F. Parker, Jr., is manager.

Development work at the Keystone mine of the Park City Consolidated Mines Company in Gunnison County, Colorado, continued during the winter months under the supervision of Nolan Probst of Crested Butte. The operating management of the mine is under the control of the American Smelting and Refining Company. Only a limited amount of development ore was stockpiled at the mine during the winter. The major development program was to interconnect the

three adits by a series of raises. Raising from the lowermost adit to the intermediate adit required 300 feet and then an additional 300 feet to the upper adit. Mine development is continuing.

J. M. Smith and C. R. Rugg of Nederland, Colorado, have started an exploration project at their Boulder County, Colorado tungsten mine under terms of a contract with the DMEA. The government's share of the \$24,400 project is \$18,300. Four men are now employed, sinking the Lower Rambler shaft from the present depth of 150 feet to 210 feet. Drifting will be done both ways from the shaft on the Ferberite vein. There has been considerable production in the past from this same vein on the 90-foot level.

The United States Vanadium Company has completed remodeling of its custom uranium-vanadium ore sampling plant at its Uravan, Montrose County, Colorado plant. Remodeling cost was \$48,000, according to general manager A. P. Cortelou. U. S. V. purchases ores from independent miners, in addition to treating company ores at its Uravan plant. Uranium concentrate is sold under contract to the U. S. Atomic Energy Commission, while the vanadium concentrate is sold

to an affiliated ferro-alloy making company.

Mine development at the Dolores County, Colorado mines of the Dolores Springs Mill and Mining Company is scheduled for early June, weather permitting, according to manager Carl Timmie.

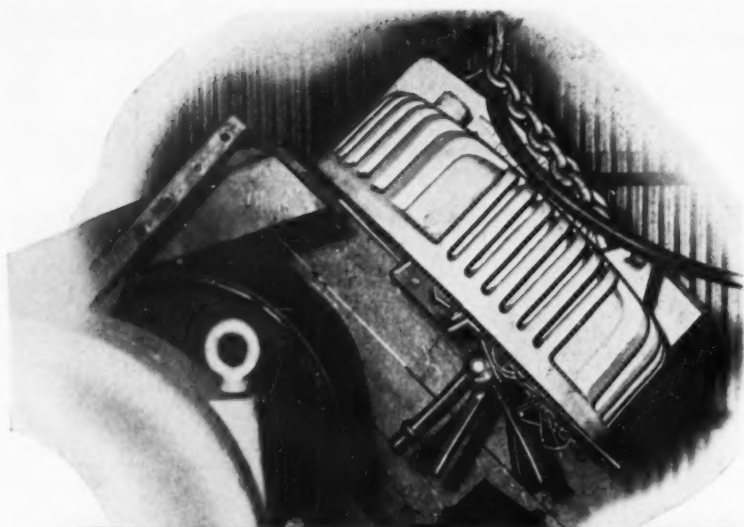
Increased wages have been granted to the 274 employees of the Resurrection Mining Company at Leadville, Lake County, Colorado, according to manager Barney Greenlee. The increase was \$1.00 per eight-hour shift for production workers with the new rate for shaftmen being \$12.35 per shift. Muckers, mill, and surface laborers received a \$0.30 per shift raise.

Construction of a 25-ton-per-day mill at Placerville, San Miguel County, Colorado has been started by the Bachelor Corporation. The mill is designed to treat uranium ore as well as complex base metal sulphide ores. Robert L. Ludwig, vice president and general manager, is in charge of operations. The corporation has also started a crew of men, under the direction of L. B. Wright, developing the Robinson mines near Placerville.



CLIMAX RESUMES WORK AFTER WINTER

Open-pit mining of molybdenum ore has been resumed at the Climax mine of the Climax Molybdenum Company in Lake County, Colorado, following the usual winter shutdown. This open-pit method is used to salvage remnants of ore adjacent to the old White and Leal levels which cannot be recovered by the mine's block caving. The pit area is high on the western slope of Bartlett Mountain, 650 feet above the Phillipson level. The ore is drilled, blasted, and loaded into trucks for the short haul where it is dumped into one of two ore passes which drop to the Phillipson level where it is loaded into mine cars. Open-pit operations are contracted to C. Ryan & Sons, contractors of Lakewood, Colorado. Frank Coolbaugh, general superintendent, directs both the underground and surface operations.



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The U. S. Lead Corporation is operating its Superior mine at Montezuma, Summit County, Colorado, two shifts per day. Hugh Chisholm is superintendent and Leland Sharp is night foreman. Both men live in Montezuma.

Buck Oelrich and associates are sinking a winze at the St. Johns mine in Summit County, Colorado's Montezuma district. Heavy winter snows have prevented ore shipments so underground activity has been limited to development work.

The Canyon Gold Corporation, Cripple Creek, Colorado, has started a stope on the Rubie vein from the 11th level of its Rubie gold mine, according to Troy Wade, president. Drifting is also continuing on the vein which varies from 8 to 18 inches. Shipments of ore to the Golden Cycle Corporation's Carlton mill are continuing from stopes on the upper levels of the mine.

Exploration and mining in the Long Park area west of the Bitter Creek mine of the Vanadium Corporation of America has indicated substantial reserves of uranium-vanadium ore. Part of the ore has been developed on leased claims and part on claims purchased in December by the company. Ore is trucked eight miles to the company's Naturita plant. D. W. Viles of Durango is vice president in charge of mining and Booth Eckmann of Naturita is in charge of the Long Park development.

The Ajax mine of the Golden Cycle Corporation at Victor, Colorado, is working one shift per day and producing about 1,600 tons of good grade gold ore monthly. M. H. Grice is foreman and directs a crew of 16 men on surface and 34 underground. All ore is trucked to the Cycle's new Carlton mill.

The Bullion mine at Montezuma, Summit County, Colorado, is being reopened by Bert Goodman of Montezuma. The lead-zinc-silver mine is reached by a mile-long aerial tram over which all mine supplies are transported. Shipments of ore are to begin shortly after timbering now underway is completed.

The Lupton Mining Company is now operating its Commonwealth differential flotation mill north of Georgetown, Clear Creek, Colorado. The mill is treating lead-zinc ore mined at the company's Grizzly mine, San Juan tunnel level, west of Silver Plume. Ellis P. Lupton of Georgetown is company president.



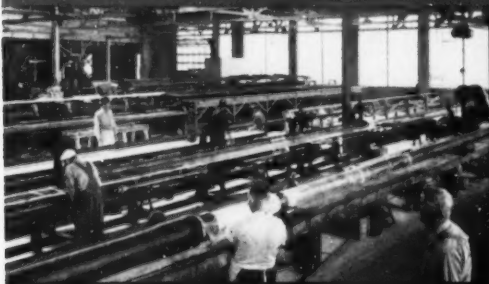
A stepped-up program of exploration is under way at the Dansie group of uranium-vanadium claims of the Excelsior Uranium Corporation at Bow Knot, Green and Emery counties, Utah, according to Vance E. Thornburg, manager. The corporation and the DMEA are sharing costs of the \$59,293 exploration project. The corporation recently completed a new truck road into the area from Spring Canyon.

The Kentucky-Utah Mining Company has finally received approval of its application for a \$35,000 DMEA loan for exploration of its Dixie-Apex vein at its mine in Big Cottonwood Canyon south-

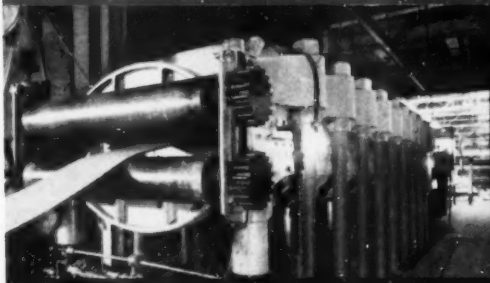
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east of Salt Lake City, Utah. The loan was applied for during the summer of 1951 and the company and the DMEA will match funds for the lead-zinc-copper exploration. E. J. Jeremy of Salt Lake City is president.

Deer Trail Mines has started shipments of lead-zinc sulphide ore carrying gold and silver from its mine near Marysvale, Piute County, Utah, according to superintendent John W. Wilhelm. The ore is being mined from the lower levels.

The *Harrington Mines Company* has started a \$125,400 joint cost-sharing exploration contract with the DMEA at its leased *Harrington* mine near Milford Beaver County, Utah. Funds will be used to explore for lead-zinc-copper orebodies in the limestone below the mine's 500-foot level.

The *New Park Mining Company* has completed excavation and concrete lining of its new underground hoist station at its *Mayflower* mine at Keeteley, Utah. Assembling of the new, double-drum, Nordberg hoist is scheduled for early completion, with operation scheduled in July, according to Clark L. Wilson, superintendent. The new hoist will permit deeper exploration and mining, as well as speeding up of hoisting operations below the *Mayflower* Tunnel level.

The *Reconstruction Finance Corporation* has approved a \$120,000 loan to the *Chief Consolidated Mining Company*, Eureka, Utah under provisions of the Defense Production Act. The loan funds will be used to purchase equipment to speed mining of lead-zinc ore from the lower levels of the company's mines.

Cecil R. Woodman of Gold Hill, Tooele County, Utah, is exploring for tungsten in the Gold Hill district with funds from a DMEA loan recently approved in the amount of \$12,379.

The *White Canyon Uranium Company* has received a DMEA loan for exploration work at its *White Canyon* uranium mine in San Juan County, Utah. The government's share of the \$52,376 exploration project is \$47,138.

An exploration project for uranium-vanadium ore is underway in the Temple Mountain district of Wayne and Garfield counties, Utah, by the *J. R. Simplot Company, Inc.* The joint company-DMEA program is estimated to cost \$71,489. George McHugh is general manager of Simplot mining operations.

The *Thornburg Mining Company* of Monticello, Utah, has an exploration crew at work in the Navajo Indian Reservation or northern Arizona. Daniel L. Hayes is field manager of the company's uranium exploration.

The *Vanadium Corporation of America* is continuing development of its *Prospector* and *Freedom* uranium mines in the Marysvale, Piute County, Utah, mining district. Development is centralized through Vanadium's new shaft with cross-cuts extending to the nearly parallel vein systems. Vein development has disclosed additional pitchblende ore. Reserves of ore are now sufficient for the corporation to consider the erection of a local mill and an option has been secured on a favorable mill site. D. W. Viles of Durango, Colorado, vice president in charge

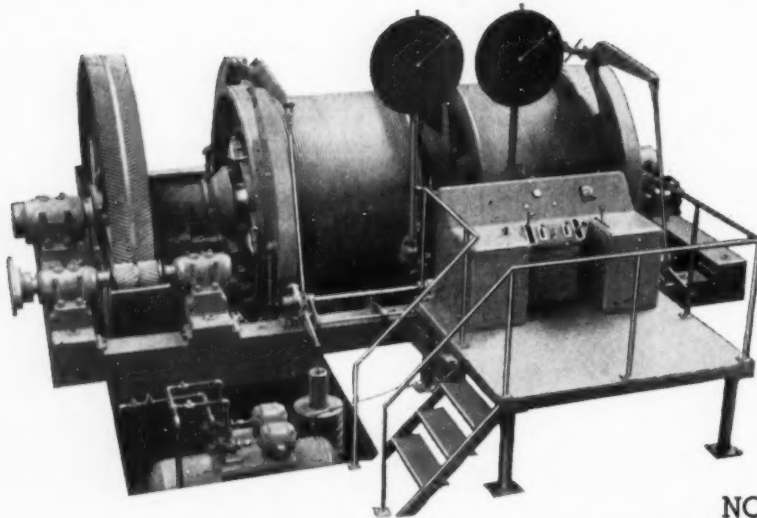
of mining for VCA, has supervised development work for the more than two years the corporation has been developing its mines.

WYOMING

Charles R. Rudolph of Wamsutter, Wyoming, and others have staked over 100 placer claims for uranium in southern Fremont County. Uranium mineralization was discovered in the area in November 1951.

The *United States Department of Interior* has withdrawn 65,000 acres of public land to mining claim location in northeastern Wyoming. The land, in the Pumpkin Flats district of Campbell and Johnson counties, was withdrawn for entry at the request of the *United States Atomic Energy Commission* because uranium was found there last October. The *United States Geological Survey* made an aerial survey of the area and geologist J. D. Love noted the presence of a high degree of radioactivity with the airborne detection instruments. Subsequently, a ground crew discovered a carnotite-like uranium mineral. Winter storms delayed prospecting but the USGS now has crews in the area. Any significant deposits will be mined by private companies under arrangements with the AEC. Unmineralized areas will be returned to the public domain.

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MINING WORLD

precipitates—CENTRAL and EASTERN

Will Construct New Zinc Mill In Wisconsin

A zinc concentrating mill to treat ores from his Edmond mine in Iowa County, Wisconsin, is being built by Vernon C. Davis of Linden, Wisconsin. The mill will cost \$140,000, while another \$50,000 will be spent for a mine plant and to open up the ore body which is located on 431 acres of leased ground.

The mill is designed to crush and jig 240 tons per day, while the flotation section is rated at 120 tons per day. It is estimated that 6,000 tons of 60 percent zinc concentrate will be produced annually, which will be twice the rate called for under a purchase contract signed with the Defense Materials Procurement Agency.

The DMPA has agreed to underwrite the purchase of up to 3,000 tons of slab zinc from the new plant at 15¢ per pound f.o.b. East St. Louis, in the event that Mr. Davis cannot sell it to consumers at that price or a higher rate. The agreement will terminate three years after production starts or when the equivalent of 3,000 tons of slab zinc has been produced, whichever occurs first.

Largest Tax Write-Off Goes to Erie Mining Co.

The Erie Mining Company has received the largest single certificate of necessity for accelerated tax write-off in the history of the Defense Production Administration. The certificate covers about 75 percent or \$223,552,500 of the nearly \$300,000,000 estimated cost of the proposed taconite concentration project near Aurora, Minnesota, which will permit this amount to be depreciated in five years instead of the usual 25 years. Final decision to undertake the project is awaiting "solution of the tax problems involved," according to Elton Hoyt II, president of Erie Mining.

The project includes construction of a concentration plant with an eventual capacity of 10,500,000 tons per year; a housing program for 6,000 people, near Aurora; a 65-mile railroad from the plant to Lake Superior; harbor facilities at Two Islands, Minnesota; and a power plant.

Erie is owned by Pickands Mather & Company, Bethlehem Steel Corporation, The Youngstown Sheet and Tube Company, and Interlake Iron Corporation.

Minnesota To Triple Water Use by 1975

The use of water in the Minnesota mining area is expected to triple in the next 25 years. According to Sidney A. Frellsen, director of the water division for the state conservation department, the increase in low-grade ore beneficiation will raise the area's water consumption from the present 55,000,000 gallons per day to 171,000,000 gallons per day by 1975.

Conservation Commissioner Chester Wilson says that hearings held at various places in the state have shown the need for more accurate information about the

state's water resources, and for legislation to determine how available water should be divided when there is not enough to go around.

An order from Mr. Wilson has been filed with the St. Louis County Board granting the Oliver Iron Mining Division permission to take an average of 1,200 gpm. from West Two Rivers for the taconite plant being constructed near Mountain Iron. The project provides for construction of a dam near the junction of the east and west branches of West Two Rivers and for maintenance of a reservoir north of the dam. The dam will be 20 feet wide at the top and not less than 120 feet at the bottom. Return water from the tailing basin and water from the Mountain Iron, Suively, and Iroquois mines will be pumped into the reservoir. No industrial pollution may be found in the water returned and the order forbids the company to deprive Mountain Iron village of its water supply.



Production of sulphur by *Freeport Sulphur Company* in the first quarter of 1952 was the greatest in any quarter in the company's history. Total output reached 413,000 long tons in the quarter.



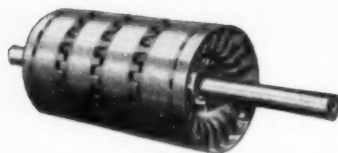
EXTRACTING MAGNESIA FROM THE SEA

The importance of extracting magnesia from the chemical resources of the sea is illustrated above at the Cape May, New Jersey, sea water magnesia plant of Northwest Magnesite Company, a subsidiary of Harbison-Walker Refractories Company and General Refractories Company. Here, a total of six Dorr thickeners are installed—ranging from 152 feet to 320 feet in diameter. One 250-foot unit is used to clarify sea water after the precipitation of calcium carbonate in the 152-foot Dorr. Another is paired with the big 920-foot Dorr as the first stage in the washing series, the final stage of which is carried out in the two 200-foot units. In addition to these six Dorr Thickeners, an 85-foot diameter Type H-1 Hydroseparator is used as a reactor and two Dorr Classifiers are installed for degrittling milk of lime.

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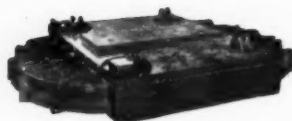


recommended where burden depths do not exceed 3". Within this range, these are the magnets to use because of their unsurpassed concentration of magnetic strength near the surface. Catalog C-1007A.

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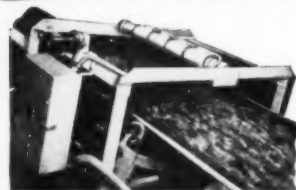


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able for belt widths from 18" to 72". Two types are available. One employs an electro magnet and the other, a permanent magnet. Performance of the two is comparable.

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The Northeastern Regional Headquarters of the U. S. Bureau of Mines will conduct a diamond drilling program on an extensive manganese deposit in Aroostook County, Maine, to obtain samples which will be tested in its laboratories to determine whether the ore can be upgraded on a commercial basis for the steel industry. Reserves of manganese-bearing material in this county are estimated at several hundred millions of tons, containing sufficient manganese to supply the requirements of the entire nation for at least 30 years at the present rate of consumption. However, like most other large domestic reserves, they are low grade, and extremely difficult to beneficiate. They are not being used commercially today. The metallurgical laboratories at College Park, Maryland, have already tested thousands of pounds of manganese samples from four different sites in the Aroostook area. These were from the *Dudley* deposit, west of Mapleton; the *Maple Mountain-Hovey Mountain* deposit, west of Bridge-water and the *Littleton Ridge* and *Carpenter Farms* deposits, northwest of Houlton. In the newest Aroostook project, the diamond drilling contracting firm of *Sprague & Henuood* will drill four holes totaling about 1,000 feet at the *Dudley* deposit. These will be the first such samples from this deposit to be obtained through a Bureau project; earlier metallurgical tests by the government had been run on dump samples only.

A new ore hoist has been installed at the *Scrub Oaks* mine, six miles northwest of Dover, New Jersey, which will enable iron ore to be mined from lower levels. The mine is operated by the *Alan Wood Steel Company* of Conshohocken, Pennsylvania.

Production from the *Balmat-Edwards* Division of *St. Joseph Lead Company* in New York increased to 77,742 tons of zinc concentrates in 1951, compared with 72,548 in the previous year. The new 875-foot shaft for the northern ore bodies was completed. The capacity of the *Balmat* mill was increased from 1,200 to 1,800 tons per day. Underground development work on the new shaft is about finished. Ore development at *Balmat*, as well as in depth at the 400-ton-per-day *Edwards* mine, has been most encouraging.

American Zinc, Lead and Smelting Company is currently operating four zinc mines in east Tennessee. Ore from these mines is concentrated in the *Mascot* mill, which produces zinc concentrates and by-products of stone, sand, and agricultural limestone. This is the company's largest mining operation. Active development in 1951 resulted in the opening up of a fifth mine, known as the *North Friends Station* mine in the same area. Production is at the same rate of 500 tons per day. It is expected to increase concentrate output for 1952 by about 10 percent or 4,000 tons. Another large ore body, within reasonable shipping distance of the *Mascot* mill, was discovered and developed during 1951. Preliminary work for the sinking of two shafts and underground development of the new mine

are proceeding as rapidly as possible to bring in 300,000 tons of ore yearly by the end of 1953. Additional facilities will be added to the *Mascot* mill to bring capacity up to 1,500,000 tons annually, producing an average of 75,000 tons of concentrates. This rate of production is expected to be reached by the middle of 1954. Another 8,200 acres are under option in the area. During the year, the company also acquired the properties of the *Nellie B. Mining Company* in the Oklahoma section of the Tri-State lead and zinc district. Plants there are treating from 3,000 to 4,000 tons of zinc-lead ores daily. *American Zinc* also joined with *Brown & Root, Inc.*, of Houston, Texas, in a joint venture in the Tri-State district north of Neck City, Missouri, the new mine, to be known as the *Quick Seven* zinc-lead mine, will be open pit, producing about 2,000 tons of ore daily.

Milling facilities are being installed and production will start around June at the annual rate of 12,000 tons of zinc concentrates.

The *M. A. Hanna Company*, agent for *Morton Ore Company*, is installing a 72-inch *Wenco* classifier at the *Morton* mine at Hibbing, Minnesota.

Out of total proposed expenditures of \$4,610,769 by two firms—*Pickands Mather & Company* and *Butler Brothers* (now operated by *M. A. Hanna Com-*



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pany), \$2,946,335 will be covered by certificates of necessity issued by the Defense Production Authority. The money will be used at Cooley, Minnesota, and Coleraine, Minnesota, for mining equipment, stripping, and mine development.

The mine inspector of St. Louis County, Minnesota, reports that of the 231 mines in the county, 116 were active during 1951. A total of 60,249,538 tons of ore was shipped from the county, of which a little more than 3,000,000 tons came from underground mines and 57,000,000 tons from open pits. Over 71,000,000 cubic yards of stripping was moved during the year, and the average number of men employed was 11,884.

The *Oliver Iron Mining Division of U. S. Steel Corporation* has over 400 men working on its experimental taconite beneficiation plant at Mountain Iron, Minnesota. Over 1,000,000 cubic yards of overburden has been stripped at the new open-pit site and about 500,000 cubic yards of dirt and rock removed for plant foundations and railroad track right-of-way. Pouring of the 7,500 cubic yards of foundation concrete has been completed and erection of the more than 3,000 tons of structural steel is well advanced. The Minnesota Department of Conservation has granted approval for use of 1,200 gallons per minute of water at the plant and for the construction of a 22,000,000 gallon water storage reservoir.

The *Hanna Ore Mining Company* has placed an eight-cubic-yard-capacity excavator in operation at the *Mississippi* group of mines. The *Hanna Coal & Ore Corporation* has placed a new 6½-cubic-yard excavator and five new 30-ton trucks in operation at the *Carlz* mine.

The *Inland Steel Company* is demolishing the headframe at its idle *Barnes-Hecker* mine, about five miles west of Ishpeming, Michigan. The 75 tons of steel it contains will be used as scrap at Inland's furnaces.

The *Cleveland-Cliffs Iron Company* is installing a 66-inch Wemco washing classifier in its *Hawkins* mine concentrating plant at Nashwauk, Minnesota. P. P. Swanson is mine superintendent. Grover Holt of Hibbing directs Minnesota operations for Cleveland-Cliffs.

The *Whiteside* mine of the *Snyder Mining Company*, located near Buhl, Minnesota, is being stripped to be an open pit producer. A skip will be used to hoist the ore to the surface as at the *South Agnew* and *Schley* mines. Estimated tonnage at the Whiteside is about 1,000,000 tons. A former underground mine, it made its last shipment in 1927.

A second pilot plant is being constructed at Riverton near Crosby, Minnesota, on the Cuyuna Range, to determine if high-grade manganese can be commercially produced from the Cuyuna's low-grade ores. *Manganese Chemicals Corporation* of Minneapolis is building the plant. The first pilot plant was built at Fort Snelling and a U.S. Bureau of Mines process for recovering manganese is being tested there. At present, the United States imports about 90 percent of its manganese.

Michigan's 1952 iron ore reserves are estimated at 162,221,900 tons, worth about \$79,010,000. This was broken down as follows: Marquette County, \$33,754,000; Iron County, \$25,941,000; Gogebic County, \$19,030,000; and Dickinson County, \$285,000.

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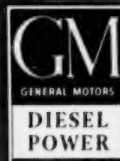
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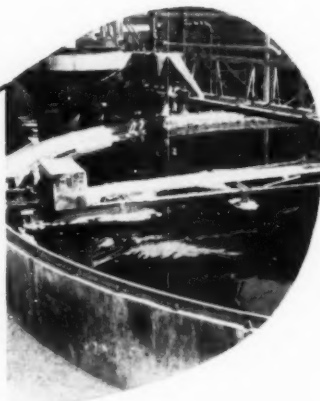
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MINING WORLD

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Custom Mill for Tungsten Ready to Receive Ore

The Hillside Mining and Milling Company at Hillside, Arizona, expects to have its custom mill ready to receive and to treat tungsten ores early this month. According to Superintendent E. G. Green, the tentative purchase schedule calls for a \$6.00-per-ton milling charge, plus 10 percent of net return. He has urged all potential shippers to submit 25-pound representative samples for testing so that a tentative report can be made on the realizable net value, with data showing methods of computation used to arrive at that figure.

The tungsten unit at the Hillside mill is an addition to the present lead-zinc-copper concentrator. A conventional gravity plant of 300 tons capacity will treat the Hillside ore and custom ores. The gravity section includes crushing and grinding equipment with concentration by flotation, tabling, and magnetic separation.

Principal production for the mill will come from the Tungstona and the Black Pearl mines. The Tungstona is operated by Hillside under a lease agreement and has been under development for the last year. Ore in the Tungstona vein is said to average 0.25 to 0.40 percent WO_3 . It will be beneficiated in a WEMCO Mobil-Mill to a 2.00 to 3.00 percent grade, and then concentrated to specification grade by gravity methods.

The Black Pearl is located in the Eureka mining district and is being developed by Edgar A. Scholz and J. H. Cazier under leasing arrangements. The mine has been an intermittent producer ever since its discovery in 1914, with total output equivalent to slightly less than 4,000 units of 60 percent WO_3 , from ore containing about 0.78 percent WO_3 .

Sixteen miles of graded road is being built to connect the Black Pearl with the Hillside mill. The road has been made possible by the government's access road program and is approximately 50 percent completed. Operation of the Hillside mill is expected to bring about a material increase in tungsten production in the district, as it will provide a near-by market for ores which are amenable to the treatment process employed.

Company Buys Elora Mill For Tungsten Property

The Minerals Development Corporation which recently acquired the Tungsten Reef claims in the Huachuca Mountains of Arizona, has purchased the Elora Gold Mining Company's mill near Wickenburg, Arizona. The company hopes to be ready for production within 60 days.

The mill will be dismantled and such equipment that can be used will be taken to the tungsten property. This will be supplemented with new equipment to provide a modern mill of 50 tons capacity per eight-hour operation. The mill will consist of coarse and secondary crushers, jigs and tables, with provision for a minor amount of flotation for removal of a small

amount of impurities from the table concentrate.

The ore will be mined by open-pit methods, a power shovel loading the ore into two or three trucks which will haul it to the sorting plant. About 150 to 200 tons will be delivered to the conveyor belt every eight hours, from which about 50 tons of scheelite ore will be hand-picked under a black light for milling. The company would be willing to treat custom ores suited to the methods used in treating the Tungsten Reef ores. Old production records indicate that ore from the Tungsten Reef averaged about 0.5 percent WO_3 after some sorting underground by the miners. It is hoped that by more efficient sorting, the average content of the ore going into the mill will approximate 1.00 percent WO_3 .

About 10 men are employed at present; five small prefabricated houses have been erected; and the mill site is being cleared. Len Acton of Dallas, Texas, is president; and Hugh W. Coke of Bisbee, Arizona, is general manager.

Kaiser Buys Land For Nevada Fluorspar Mill

Kaiser Aluminum & Chemical Corporation has purchased 50 acres of undeveloped land near Fallon, Nevada, as the site of its new fluorspar concentration mill. The site is about 70 miles northwest of the recently purchased Baxter mine which will supply most of the ore for the mill.

Construction will start soon. The capacity has not yet been determined but production is expected by this fall. H. S. Fowler, former mill superintendent at the Kaiser-operated magnesium plant at

Manteca, California, will be general superintendent.

Arrangements have been made with the General Chemical Division of Allied Chemical and Dye Corporation to make aluminum fluoride for Kaiser at a plant to be built at Pittsburg, California. Kaiser will supply the fluorspar concentrate from its Nevada operation.

ARIZONA

The Defense Minerals Exploration Administration has awarded an exploration contract to *Yucca Mining and Milling Company, Inc.*, of Yucca, Arizona, for use at the *Antlers* mine. This copper-lead-zinc project calls for the expenditure of \$69,896, of which the government will contribute \$34,948, or 50 percent. The company has been a regular producer since completion of its 125-ton concentrator about three years ago. Output during the past year has varied from 750 to 2,500 tons of ore monthly, with principal workings on the 400 and 500 levels. R. J. Dalton of Yucca is president and general manager. Robert O. Giroux is mine superintendent.

Golden Crown Mining Company, with claims in the Big Bug mining district of Arizona adjoining the *Shattuck Denn Mining Corporation's Iron King* mine, is drilling a second and deeper hole in the hope of penetrating ore. The first dia-



STRIPPING ARIZONA BENTONITE MINE

The Sanders mine, one of Arizona's most consistent nonmetallic producers, is shipping regularly from its open-pit deposit in Apache county. Here, a Caterpillar Diesel DW10 tractor with No. 10 scraper is shown stripping and hauling overburden from the bentonite mine owned by McCarrell & Grimes. Bentonite, a claylike substance derived from volcanic ash through weathering or alteration with montmorillonite as the major mineral constituent, is used principally as a binder, filler, constituent of drilling muds, and in filtering and decolorizing.

mond drill hole drilled diagonally eastward from the bottom of the Brown 450-foot shaft showed that the Iron King vein structure continues northward into Golden Crown property. Two veins, five and eight feet wide, were penetrated. Although too high and too close to bedrock, they showed considerable sulfides with zinc, lead, gold, and silver mineralization. Golden Crown is controlled by *Western Gold Mines, Inc.*

C. D. Brock, president of the *U.S. Manganese Corporation* in Phoenix, Arizona, has announced the purchase by his firm of *Mahoney Gold Mines, Inc.*, also known as the *Monte Cristo* mine, 12 miles northeast of Wickenburg. The milling plant is being converted to handle tungsten ores, and will have a daily capacity of 70 tons. The company proposes to treat ores from its own properties, as well as custom ores. The corporation also owns its own milling plant at Aguila, Arizona, for the handling of manganese ores from its own properties in the vicinity and custom ores. This mill has an approximate capacity of 150 tons daily.

The *Ray Mines Division of Kennecott Copper Corporation* at Ray, Arizona, produced an all-time high tonnage of ore in 1951. During the year, the company mined and milled 4,213,154 tons of ore, of which 3,049,426 tons were produced by open-pit mining and 1,163,728 tons by underground mining. This record is in contrast to that of 1950 when a total of 3,056,425 tons of ore were mined and milled, of which 1,628,921 tons came from the open pit and 1,427,504 tons came from underground. Increased capacity, both for crushing and milling, were made available during the year.

The *Sunrise Mining Company* headed by Taylor Glass of Austin, Texas, is operating the *Globe* mine in the Tyndall Mining District in southern Arizona. Ross Barclay of Patagonia is manager, and Frank Otero of Nogales is superintendent. Some shipments of lead-silver-gold ore have been made from room and pillar stopes off the tunnel openings. Recently, a raise to the surface was started to provide better ventilation and an emergency exit.

A small asbestos mill is being erected by *Western Chemical Company* at its claims near Chrysotile, Arizona. The company recently acquired the idle asbestos holdings of *Johns-Manville Corporation*, a group of 88 claims in the McMillan Mining District, 30 miles east of Globe. Considerable reconditioning of old workings is required before production can be started. Principals in the new organization are W. D. Cluff and Gerald Johns of Los Angeles. Frank Witty of Globe is manager.

American Asbestos Cement Corporation of Globe, Arizona, is mining from 350 to 400 tons of ore monthly, with recovery of 80 to 100 tons of asbestos fiber. Charles Kohl is in charge of operations at the property. L. J. Brewster is the geologist and engineer in charge of the DMA exploration program for which the company received a government loan. A crew of 30 men are employed.

The *Phelps Dodge Corporation* has completed designs for its new 12,000-ton-per-day flotation plant at Bisbee, Arizona to process low-grade copper ore from the Lavender Pit (Bisbee East orebody) which is under development. A total of 144 Fagregren cells will be used;

12 9-cell roughers and 12 3-cell cleaners. H. V. Kruse, chief engineer of the mechanical department, is in charge of designing. During 1951, approximately 3,159,600 tons of waste were removed from the Bisbee East Orebody in connection with the development of the Lavender Pit. The pit will be over two-thirds of a mile long and just under half a mile in width at its greatest dimensions; from the highest point on Sacramento Hill to the bottom of the finished excavation, depth will be over 900 feet. Initial stripping operations have established four benches in the Johnson Hill area. Electric shovels, used for loading waste into trucks after it has been drilled and blasted, will also be used for handling the ore. Two electric shovels and twelve 25-ton dump trucks were acquired in 1951. Concentrating ore will be moved from the pit in 25-ton trucks to the primary crusher. The crushed ore will travel by belt conveyors to the concentrator. Leach ore and waste to be hauled to the dumps will be transferred from trucks to trains at the pit edge.



Caselton-Milbank Housing, Inc., a subsidiary of *Combined Metals Reduction Company*, has awarded contracts for the construction of the 100-home project at Combined Metals' lead-zinc and manganese property at Caselton, Nevada.

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This application of RESISTO-LOY is a job that can easily be done the first time and repeatedly thereafter by your own plant maintenance welder. There are just a few simple instructions which our field man will gladly discuss with you. Don't overlook this important economy.

RESISTO-LOY CO., Manufacturers, Grand Rapids 7, Michigan

Production has started from the *Iron Age* mine at Twentynine Palms, California, on a schedule to provide 250 tons daily. The ore is trucked to Amboy for shipment to domestic points at present, although it is reported that some could possibly be sent to Japan because the grade in Fe is considered above average. The operation is a private venture.

Diamond drilling from the 200-foot level of the main workings of the *Abbott* mine in Lake County, California, has disclosed quicksilver deposits in the contact zone of serpentine and shale. The mine was discovered in 1852 and is currently being operated by *California Quicksilver Mines*.

The *Natomas Company* operated seven dredges in the Folsom district of California during 1951. Six were in operation during the entire year, while the seventh was used only for a period of six months and then scrapped. An appreciable loss was suffered on the *Greenan Placers* operation in Lander County, Nevada, caused by a slide and other difficulties. Exploration during the year was confined to preliminary investigations of several properties, of which two or three were considered worthy of additional testing. Final checking was done on an area in Northern California under option and the property was rejected.

American Potash & Chemical Corporation is producing Tronabor (crude Pentahydrate Borax) in commercial quantities at its plant in Trona, California. Small quantities had been produced for several preceding months at the company's pilot plant. Tronabor fills an agricultural need as a source of boron.

An asbestos deposit has been found near Foresthill in Placer County, California, by E. Abbott of Placerville, and John Whisler of Foresthill. Only surface prospecting has been done so far but the owners plan to explore to a depth of 10 to 12 feet in the hope of finding a larger commercial body. The material is amphibole.



Two scheelite properties have been acquired by Gordon and Lindsey Smith of Gabbs, Nevada, and their partner, Barney O'Malia of Hawthorne, Nevada. The new holdings are the *New Year* group in Smokey Valley and the *Warfield* and *Loring* claims which adjoin them. The partners already hold the *El Capitan* tungsten mine and mill at Gabbs and the *Commodore* tungsten mine. Work is expected to get under way on the new claims as soon as a road to the property is completed. Stanley Chiato-vich is superintendent of all of the mining operations. The *Commodore* and *El Capitan* are reported to be producing from 10 to 15 tons daily of tungsten ore. The *New Year* claims are under lease and option from Bill Thomas, and Phil and Louis Meyers. The *Loring* claim was acquired by W. J. Loring from Thomas and the Meyers. He, in turn, has granted the Smiths and O'Malia an option to examine the 14 claims. A mill may be erected on the site, if the property proves worthwhile.

JUNE, 1952

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A new firm to be known as the *Nevada Barium Company* has begun construction of a crushing and screening plant at Beowawe, Nevada, which, when in operation, will conduct custom milling of barite in that area. Meanwhile, the company will sell mine-run barite, in any quantity, having a specific gravity between 4.0 to 4.3.

Morrison-Knudsen, Inc. has taken over the open-pit mining operations of the *Round Mountain Gold Dredging Corporation* at Round Mountain, Nevada. Morrison-Knudsen will furnish the key men, while the crew will be organized from the present operating personnel. The pit will be operated two shifts per 24 hours. F. M. Jardine is field manager.

The *Eureka Corporation, Ltd.* has applied for a DMEA loan of \$1,600,000 to help rehabilitate its *Richmond-Eureka* lead-zinc-silver property at Ruby Hill, Nevada. The company has already raised \$1,778,866 from the sale of shares of stock, and is waiting for approval of the federal loan before proceeding with its rehabilitation and development program which is both costly and complex. Eureka Corporation, a subsidiary of *Ventures, Ltd.* of Canada, leased the properties from *Richmond-Eureka Mining Company* about 15 years ago. Diamond drilling had shown ore bodies in virgin ground about 1,000 feet below the Ruby Hill fault, containing zinc, silver, and lead. Early in 1949, water flooded the lower levels of the newly completed 2,350-foot Fad shaft and halted operations in the cross-cut which was nearing the deposits.

The *Nubian* mine near Tonopah, Nevada, is reportedly being developed by Norman L. Heikes of San Francisco, Burton Riggs, and associates. The mine has been worked intermittently since 1924 for its rare occurrences of turquoise.

A high-grade manganese vein has been discovered in the *Black Diablo* mine operated by *Charleston Hill National Mining Company*, south of Golconda, Nevada, near the main production area. Development work was carried on during the winter despite the severe storms. Daily shipments of about one carload a day have been resumed to *Geneva Steel Company* at Geneva, Utah.



A huge underground storage pocket for sylvite ore is nearing completion on the 900-foot level of the No. 1 shaft of *International Minerals and Chemical Corporation's* potash mine in Carlsbad, New Mexico. The pocket measures 20 by 20 feet on the sides, with an actual depth of 74 feet. Sylvite ore will be dropped to a depth of 130 feet below the 900-foot level onto a belt conveyor. In moving the ore from the 900 level to the surface, a tremendous amount of equipment is needed beginning with a completely new, air-operated rotary dump. From the dump, the ore will fall into a hopper, onto an apron feeder, and through a crusher to the pocket. From here, the ore will move through an air-operated gate onto another apron feeder, past a magnet, down a chute and

onto the belt conveyor which will rise on a 21 percent slope to the 850-foot level. This belt conveyor will drop the ore into No. 1 raise and the present hoisting pocket at No. 1 shaft. All drilling, blasting, engineering, and sinking operations for the pocket were done by International personnel. Now *Stearns-Roger Construction Company* has begun to install all structural steel and concrete.

Two New Mexico mining operations have been given defense mineral exploration contracts. One went to the *United States Smelting, Refining and Mining Company*. It provides for a \$581,842 lead-zinc exploration program at the *Bullfrog* mine in Grant County, of which the government will pay half. C. F. Williams and C. L. Bradbury of Santa Fe, New Mexico, were given the other contract for copper work in Santa Fe County. The government will pay \$83,700 of the \$167,400 total.

The *United States Smelting Refining and Mining Company* has filed application for a federal patent to a group of 33 mineral claims in the Pinos Altos mining district in Grant County, New Mexico. About 600 acres are covered by the claims.

Consolidated Copper Mines Corporation, with offices in Silver City, New Mexico, has been incorporated with a capital stock reported at \$8,000,000. The firm, consolidated as a Delaware organization, lists incorporators as Roy F. Wrigley of White Plains, New York; William F. Malcolm of Brooklyn, New York; and John J. Duffy of New York City. New Mexico agent for the firm is Robert A. Elgin of Silver City.

The *Lindsay Light & Chemical Company* has acquired a 40 percent interest in *Corona Corporation* which controls bast-nasite mining properties near Corona, New Mexico. The company will be able to purchase the remaining shares of *Corona* stock if the mining surveys being conducted show sufficient ore reserves.

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Raise Limit on Chrome Purchases at Grants Pass

The 2,000-ton limit on chrome purchases from any one source in any one year has been raised to a maximum of 5,000 tons, thanks to the steady fight waged by the members of the Oregon Mining Association, who have protested the restriction since it was passed last August.

At a meeting of miners and government officials at Grants Pass, Oregon, the higher tonnage increases in the government's chrome-buying schedule were announced. Fay Libbey, director of the Oregon State Board of Geology and Mineral Industries, reported on a recent survey conducted by his office among chrome operators. His results showed that 24 percent of those contacted replied, and they estimated that they could produce 216,000 tons of chrome over the three-year period. Most of the properties are just opening up after a particularly bad winter which closed most of the area to mining.

Anaconda Development Program Gains Momentum

Production from the Anaconda Copper Mining Company's Kelley mine at Butte, Montana, has been stepped up to 5,000 tons a day and is expected to increase to 9,000 tons within a year.

This is just another step in Anaconda's huge expansion program. Within the next five years, zinc production is expected to double; a \$4,000,000 expansion and modernization program will increase the capacity of the copper, zinc, and manganese concentrating facilities; and another new mining project may be in the making.

Development work required to bring the Kelley mine into production has shown that original estimates of 150,000,000 tons of ore available in the Greater Butte Project were conservative. Already several million tons have been added, and there is a possibility that another 100,000,000 tons will be added after exploration work in one of the areas is completed. This latter development could lead to an entirely new project which could be mined concurrently with the Greater Butte.

Zinc ore is being developed in the upper levels of the Original mine, the Lexington-Alice tunnel has almost been finished, after which zinc ore reserves in the old Alice and Moulton areas can be prepared for production; and the old Black Rock and Elm Orlu areas are being explored for manganese and zinc.

To complete the picture, the capacity of the Anaconda concentrator will be increased to more than 32,000 tons a day.

Golconda Undertakes Extensive Mining Program

Golconda Lead Mines has undertaken its most extensive exploration and development program in years, according to

Wray Featherstone of Wallace, Idaho, who is mine superintendent.

Zones which have yielded ore in upper workings will be explored at depth. A crosscut to the three-compartment south shaft has been rehabilitated and a new station has been cut. Old deep workings will be unwatered and the Golconda shear zone explored 800 feet below the mine's main adit level. Downward extension of the East Mayflower vein also will be sought. Current mine production continues at about 300 tons daily.

Mouat Chrome Mine Will Reopen With DMPA Funds

The Mouat chrome mine in Stillwater County, Montana, born and abandoned in World War II, is to be put back into production by the American Chrome Company with a \$2,825,000 assist from the Defense Materials Procurement Agency. Operating capital of \$1,000,000 will be furnished by Goldfield Consolidated Mines Company of Reno, Nevada, parent company of American Chrome.

DMPA has granted the firm a \$950,000 loan for rehabilitating housing facilities at the mining camp for the employment of 350 men. The government agency will

also supply \$1,875,000 for re-equipping the mine and mill, and will purchase 900,000 tons of chrome ore concentrates over an eight-year period. The company will then have the option of purchasing the mine and mill equipment at its appraised value or at the highest bid.

Rehabilitation of the mine is estimated to cost \$375,000, mill equipment and installation \$1,000,000, and tramway replacement about \$200,000. The mine will be re-equipped for production of 1,000 tons of ore daily, and the mill for an output of 370 tons per day of chrome concentrates containing about 40 percent of strategic chromium oxide.

The property, 50 miles southwest of Columbus, Montana, was developed by Anaconda Copper Mining Company early in the war under a Defense Plant Corporation contract. A complete town and mine camp was built, and an estimated 2,000,000 tons of ore developed. The mine was closed in 1943 after eight months' operation because of favorable chrome ore importations and all equipment and some of the housing facilities disposed of by the War Assets Administration.

E. A. Julian of San Francisco is president of American Chrome and vice president of Goldfield Consolidated, which is headed by George Wingfield of Reno. Frank Eichelberger of Spokane is vice president and consulting engineer for American Chrome.



VAN STONE PROJECT NEAR COMPLETION

Construction work is nearing completion at the American Smelting and Refining Company's \$2,000,000 Van Stone zinc project northeast of Colville in Stevens County, Washington. Machinery is being installed in the 1,000-ton flotation plant started last fall (shown at right, above). Concrete was poured all winter by thawing forms, heating water, and using oil heaters under canvas. A crushing plant with a capacity of 3,000 tons every 24 hours is well along (left, above). Mining and stockpiling of ore has started at the North pit, 1,500 feet up the hill from the mill. The kidney-shaped ore body is being stripped in 12-foot benches. Up to 40 feet of top soil has been removed over an area 1,400 feet long and 400 feet wide. Oxidized surface ore also is being removed. Another pit, one fourth the size of the main pit, is planned 600 feet to the south, according to P. A. Lewis, resident engineer. Ore will be trucked to the crusher. Milling is scheduled to start September 1, barring equipment delivery delays.



Idaho Custer Mines, Inc., is recovering 4% percent zinc, 2% percent lead, and 1% ounces of silver per ton from old mill tailing at the *Livingston* mine in Custer County, Idaho, according to president Harry P. Pearson of Wallace. An estimated 88,000 tons of tailing are being milled at the rate of 200 tons daily. Approximately 300 tons of zinc concentrate and 200 tons of lead concentrate are being shipped monthly to the *Bunker Hill & Sullivan Mining and Concentrating Company* at Kellogg. Underground mining of an estimated 100,000 tons of ore is scheduled to start about June 1.

Sun Valley Lead-Silver Mines, Inc., has resumed development work at its *Blue Kitten* property in Blaine County, Idaho. President Ross Roundy has reported. Operations were suspended in January because of snowslide conditions. A new Diesel air compressor has been installed.

Day Mines, Inc., has reported developing its *Hercules* mine ore body at Burke, Idaho down to the 1,300 level by winze. Deepening of the present 1200-foot main shaft is being considered.

Sunset Minerals, Inc. recently acquired the *Gold Standard* or *Center Star* group of five patented mining claims. The additions give the firm two and one-half miles along the strike of the main mineralized belt in the Pine Creek area of the Coeur

d'Alenes in Idaho. Bliss Moore is general manager.

Clayton Silver Mines is down more than 170 feet with its project for deepening its shaft 220 feet below the 400-foot level, W. M. Yeaman, president, reported. The mine is at Clayton, Idaho.

Idaho Goldfields, Inc., has resumed work at its prospect near the summit of Fourth of July canyon, east of Coeur d'Alene, Idaho. Heavy snows forced suspension of development work January 1. W. M. Fredericks of Spokane, president, said additional bulldozing is planned to determine extension of a promising gold-silver-lead oreshoot uncovered last season.

The Nevada Stewart Mining Company has resumed exploration work in the old upper workings of its lead-zinc mine on Pine Creek in Idaho. The program calls for a series of diamond drill holes to be run into the hanging wall from the present drift. A resurvey has shown that this drift is about 50 feet north of the ore-body and running parallel with it. Deep exploration from the *Highland-Surprise* shaft nearby has never been extended far enough north to intersect the downward extension.

New Rainbow Mining Company has resumed work at its leased *Weber* mine near Lakeview, Idaho, which was closed during the winter because of heavy snows. The company rehabilitated the mine camp, installed machinery, and started to reopen the main adit last season. About 700 feet of the 1,700-foot crosscut tunnel remains to be cleaned out. The downward extension of the orebody

is believed to be about 100 feet west of the crosscut.

J. R. Davies of Boise has purchased the old *Butter Cup* mine in Camas County, Idaho, and announced plans to treat several thousand tons of zinc ore rejected by silver-lead miners in the '90s. Some of the ore will be shipped directly to a smelter and the remainder processed in a flotation mill constructed in 1951 at the near-by *Princess Blue Ribbon* property owned by Davies.

Still pending before the state land board is the application of S. K. Atkinson veteran dredging operator of southern Idaho, for dredging rights on the site of the proposed Hells Canyon Dam on Snake River. Atkinson estimates that there are \$175,000,000 worth of monazite reserves in the 90-mile stretch of water. He figures it will require 18 years for ten dredges to work the available land. The United States Bureau of Reclamation, which wants to erect a high-level power dam, and the Idaho Wild Life Federation are said to oppose the application.

Articles of incorporation have been filed for the *Caliente Placer Gold Mining Company* of Wallace, Idaho, with a capital stock of \$200,000, by Ray S. Parrish, James Gorman, and Harry A. Martin, all of Seattle, Washington. At Priest River, Idaho, *Panamint Antimony and Tungsten Company, Inc.* filed for incorporation with a capital stock of \$250,000. Incorporators are Richard C. Thamm of Colville, Washington; H. C. O'Brien and W. Gallagher of Newport, Washington; and William E. Stevens of Priest River.

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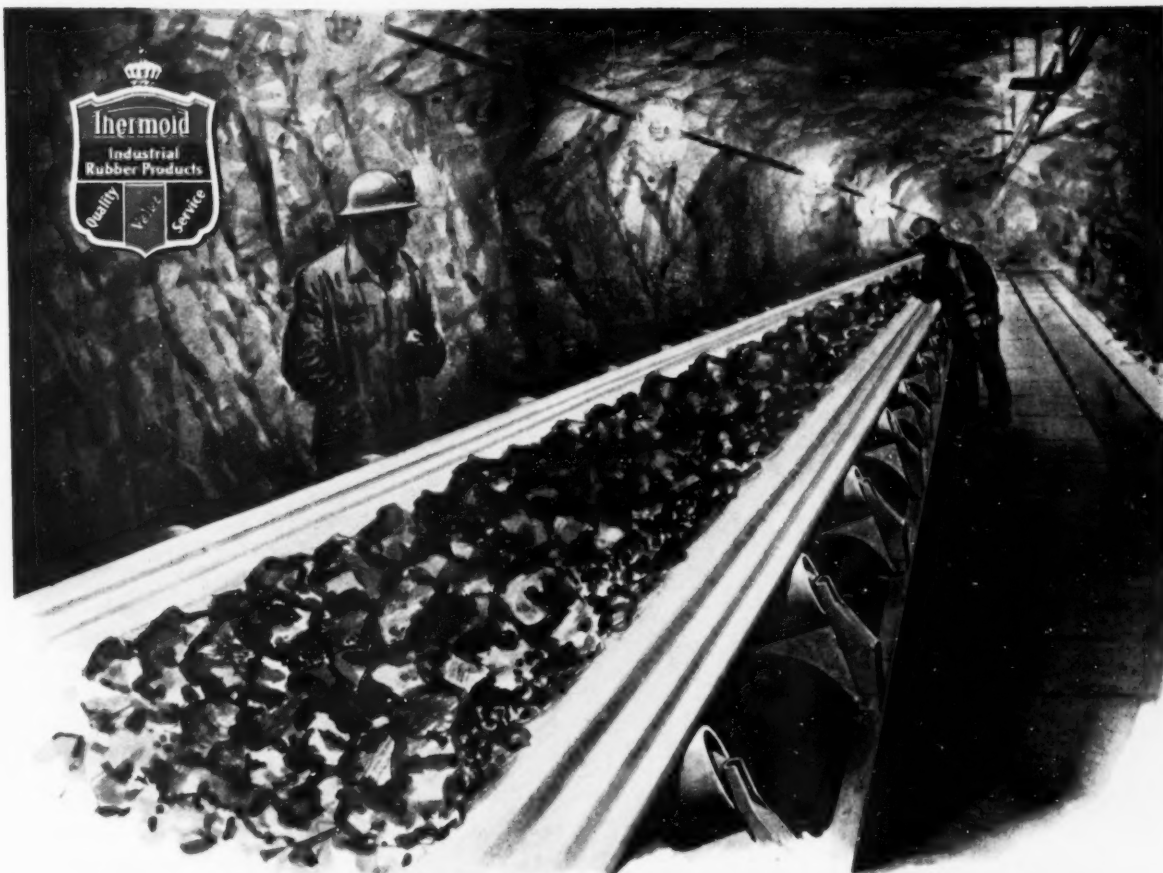
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MONTANA

Western Montana Exploration and Development Company has completed 76 percent of a \$66,500 DMEA contract on the Durand lead-zinc claims 10 miles southeast of Hall, Montana, according to Dr. Roy W. Key of Missoula who is president and general manager. A metallurgical study of the ore by American Cyanamid Company indicates satisfactory recoveries can be made. Galigher Company of Salt Lake City is designing a mill flowsheet and will furnish some of the equipment for the 200-ton mill scheduled to be constructed as soon as possible.

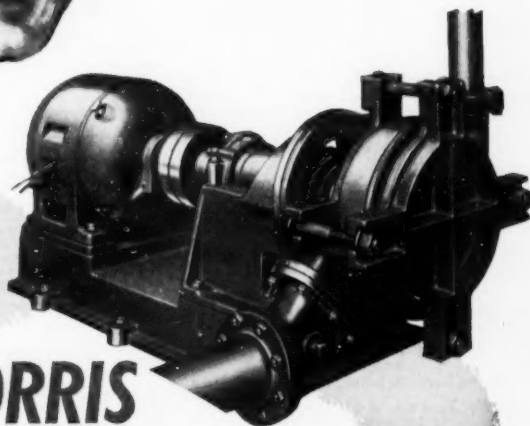
The Mines Prospecting & Exploration Company has been organized in Missoula, Montana to search for minerals by scientific methods. The firm will conduct detailed studies of the geology and structure of known ore exposures in Western Montana, will test them by geophysical methods, will bulldoze and diamond drill the area, and will attempt to get mining companies and mining men interested in taking over active development and operation of the ones that have been determined to warrant such expenditures. Earl F. Elstone, a mining engineer and attorney, will act with R. R. Wallace, an experienced mine operator, as a joint managing committee in the company's operations. Herbert C. Fisher, a mining accountant, will be in charge of the company's offices in Missoula.

Kimball Mines, Inc. is planning to construct a mine plant and to install machinery and equipment at its prospect in the Treasure Mountain mining district of Powell County, Montana, according to Sarah L. Stratton who is president. The firm is making a public offering of 250,000 shares of its nonassessable capital stock at 25 cents each to finance the further development. Since acquiring the property in the summer of 1949, the company has spent \$28,000 to drive 1,076 feet of development work. Mineralization has been disclosed and planned work includes advancing the lower tunnel and raising to the upper tunnel.

Kootenay Copper Mines has started work at the Green Mountain Mining Company property in the Revais mining district of Sanders County Montana under a \$31,900 DMEA contract, according to Earl F. Elstone, president. Plans call for extending a 227-foot incline shaft 110 feet and drifting 500 feet on the vein which has yielded \$256,000 worth of copper, gold, and platinum. Four men are at work under Steve Guilio, superintendent. Last production was in 1949. Kootenay Copper leased the property in 1950 and has done \$35,000 worth of rehabilitation work.

Recently incorporated Montana mining firms include Fernsplat Mining Company, \$50,000 authorized capital, Joseph Treloar of Kent, Washington, Emily J. and Donald C. Treloar of Kalispell, Montana, incorporators; Gold Cliffs Mines Company, \$250,000, Frank P. Madden of Dillon, Fred P. Patterson of Divide and William R. Allen Jr. of Wise River, directors; Montana Copper King Company, Inc., \$250,000, to operate in the Revais Creek mining district, Sanders County.

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The *McLaren Gold Mines Company* is being reopened after the winter season. The open pit mine is located about eight miles from Cooke City, Montana, at an elevation of 10,000 feet. Mining can only be done during the summer months so the company concentrates on extracting large tonnages at that time. William H. Hisle, the general manager, has returned to Cooke City and a crew is now being hired. The 200-ton mill closed down for the winter last January.

Kootenai Mining Company of Libby, Montana, was incorporated recently with an authorized capital of \$100,000. Incorporators are Roger H. McConnel, chief geologist of *Bunker Hill and Sullivan Mining and Concentrating Company*, and Alfred E. Nugent of Bunker Hill's geological staff, both of Kellogg, Idaho; and James E. Cyde, an attorney, of Wallace, Idaho. Other Montana firms recently incorporated include *Colmont Uranium Mines Company*, with 50,000 shares of no-par-value stock, by P. M. Mosier of Townsend, Montana, and R. G. Bayles and Richard Bayles, of Bozeman, Montana; *Copper Canyon Mining Company*, with an authorized capital of \$100,000,

by Lee, Zella, and Ernest Shook of Hamilton, Montana; and *Monia Mining Company*, with a capitalization of \$150,000, by George Sutherland, F. E. Buck, and W. T. Boone, all of Missoula, Montana.



Stripping operations are reported to have started on the black sands deposit of *Coast Minerals Company Ltd.*, near the Oregon Coast north of Bandon in Coos County. Production may also be forthcoming from the black sands deposits on Whiskey Run, considered to be one of the first gold placer discoveries along the Oregon beaches.

The *Standard* mine, north of Prairie City in Grant County, Oregon, has been sold to Ray Summers and John Day by Bert Hayes. Active underground development will start soon. The mine is said to be one of the oldest lode mines in the

state, and was once a cobalt-copper producer.

Baker County, Oregon, has three known manganese deposits containing an estimated 100,000 tons of the strategic metal. Nadine Strayer, secretary of the *Eastern Oregon Mining Association*, told the *Snake River Miners and Prospectors' Association* recently at Weiser, Idaho. She asked the Idaho Group's support in getting the deposits developed and a government manganese ore buying depot established in the area.



A vein of scheelite-wolframite tungsten ore, 14 inches wide, was opened recently at the property of *Addy Mining Company*, 18 miles west of Addy, Stevens County, Washington. Jerry Fowler of Blue Creek, foreman, said the ore would run about 2.0 percent tungsten. The vein was found lying alongside a fault disclosed by two shots into the wall of the crosscut tunnel. Exploration was started last summer. A \$21,290 DMEA project was approved last November. Plans call for construction of a 25 to 50 ton mill.

A "substantial" amount of zinc-lead ore has been opened in the Metaline Contact area of *Metaline Mining and Leasing Company's* holdings in Pend Oreille County, Washington, according to a report by L. J. Randall, vice president of the operating firm, *Sullivan Mining Company*. Further development is underway. Randall revealed also that the Sullivan firm has increased its holdings in another Metaline district company, *Pend Oreille Mines and Metals*, by 11,545 shares to a total of 729,645 or approximately 30.55 percent of the outstanding shares.

Kromona Mines Corporation expects to complete the installation of its 100-ton mill and flotation plant and to have some production under way this year. Boyd K. Zerbe has been engaged as resident engineer at the *Kromona* mine which is about 19 miles northeast of Sultan, Washington. Zerbe has been in the employ of the *Sunshine* mine at Kellogg, Idaho, for the past seven and a half years. At the recent annual meeting of the company, J. F. Krom was reelected president and general manager, J. F. Brand vice president, and George Wizer secretary-treasurer.

Phantom Creek Copper, Inc. has been incorporated in Olympia, Washington, with a capitalization of \$50,000, by Arthur W. Lehmann of Bingen; J. M. Holden of White Salmon; and S. J. Holden of Cle Elum.

Pacific Northwest Alloys Company is mining 1,600 tons of dolomite per eight-hour shift, six days a week, from the government-owned quarry at Marble, Stevens County, Washington. The dolomite is shipped to the government-owned *Mead* reduction plant near Spokane, built in World War II, where it is refined into magnesium pig, 99.95 percent pure.

Articles of incorporation were filed in Olympia, Washington, recently for a new firm to be known as *Mine Financing, Inc.* E. R. Lindgren, W. J. Carson, and C. F. Leise, all of Spokane, are the incorporators, setting capitalization at \$25,000.

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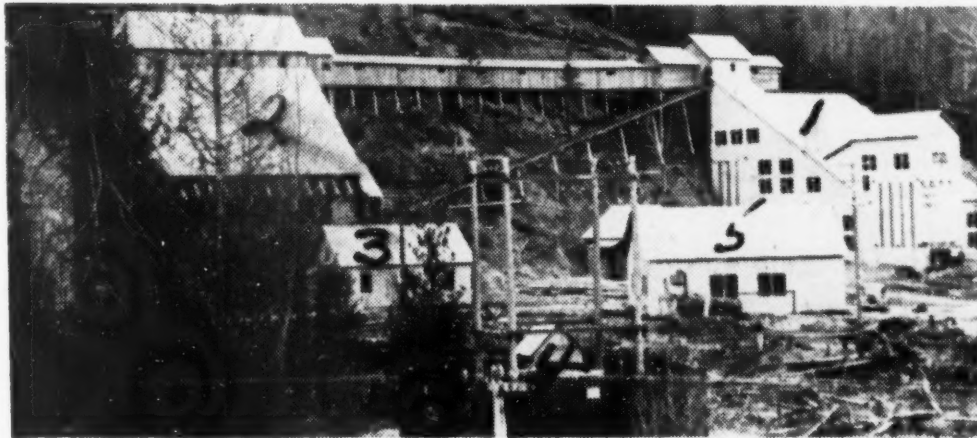
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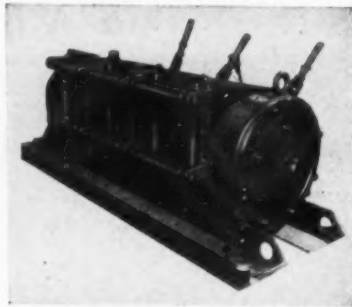
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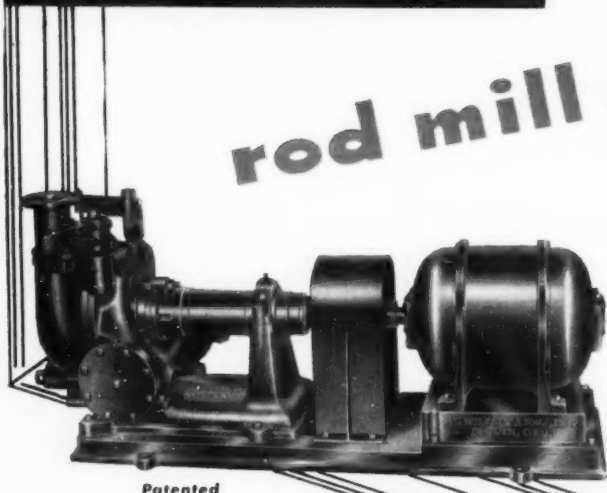
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